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GOLDEN SHOWER.
Bignonia venusta, Ker.

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JOURNAL OF THE **Bombay Natural History Society.**

1940.

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No. 3.

SOME BEAUTIFUL INDIAN CLIMBERS AND SHRUBS.

BY

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PART III.

(Continued from Vol. xli, No. 2 (1939), p. 220).

(With one coloured and 3 black and white plates and 5 text-figures).

Bignonia Linn.

The genus *Bignonia* was erected in honour of Abbé Jean Paul Bignon (1662-1743), court librarian to Louis XIV of France. Systematic botanists in the past have held very divergent views regarding the delimitation of this genus and modern research has resulted in the genus, as conceived by Bentham and Hooker with its 150 species, being broken up and the majority of its species transferred to other genera. We would warn our readers that the species, hitherto known as *Bignonia*, found in our Indian gardens and treated in this article, have all, with the exception of one, been placed in other genera of the Bignoniaceae.

The species of the genus, as known to horticulturists, have been in high favour for many years on account of the beauty and

profusion of their flowers. They are mainly extensive climbers and require generous space to be seen at their best.

The wood of the stem is very peculiar. Young stems do not show any anomalous structure, but in old stems the wood is cleft by wedge-shaped radially projecting masses of bast, which are regularly arranged in multiples of four. Those with four wedges are called 'Cross Vines' in South America and are regarded with superstitious awe. Some of these climbers grow to an immense size, and these alternating wedges of bast and wood enable them to withstand twisting and bending without fracture.

Climbing is accomplished in various ways—by twining round a support, by the possession of tendrils, by the rotation of the petioles, or by means of aerial roots. The species treated in this article make use of all these methods, either singly or in various combinations. The possession of tendrils is a very common feature.

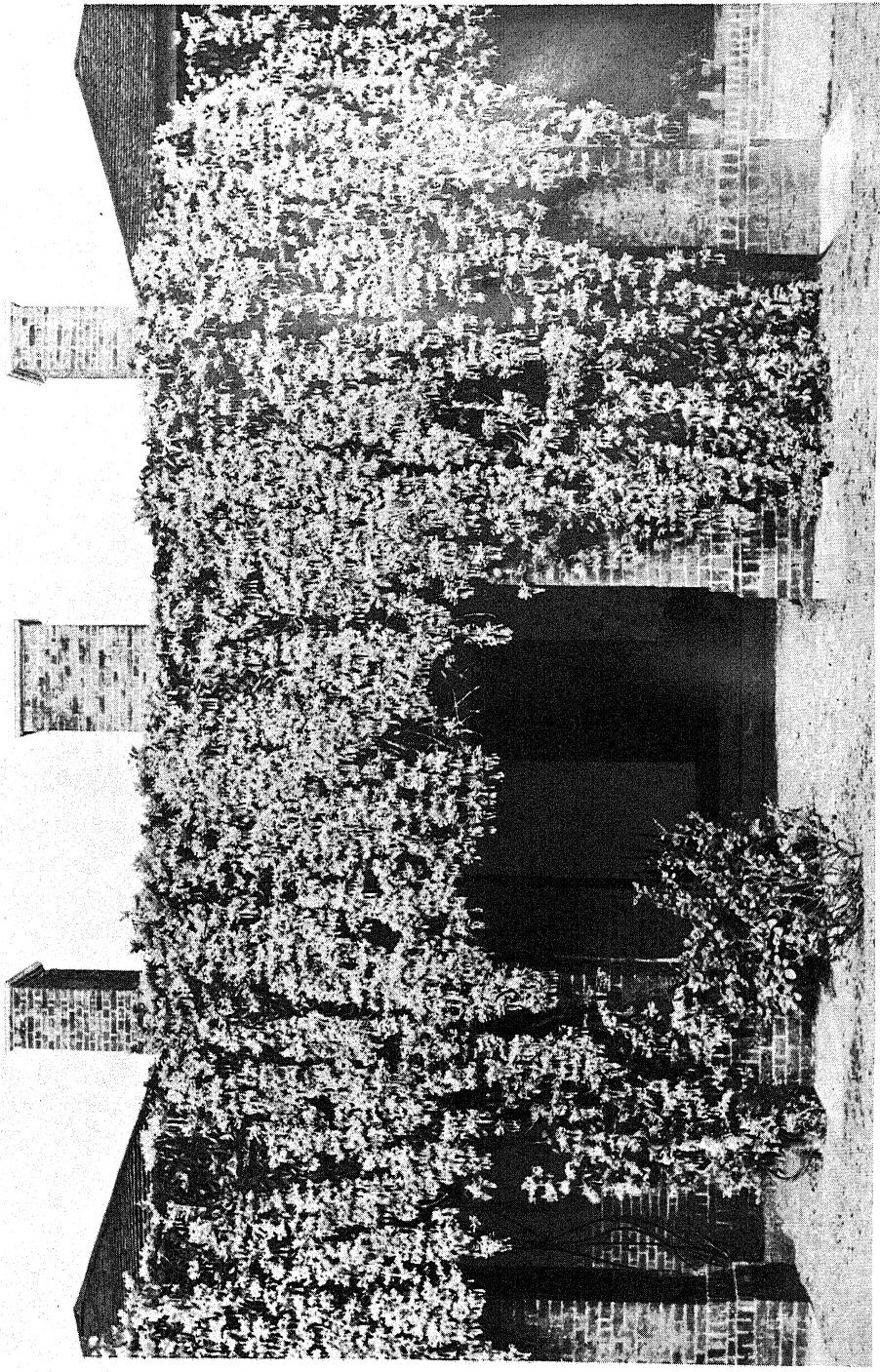
Tendrils are always modified leaves or leaflets. In the well-known *Bignonia venusta* Ker. [*Pyrostegia venusta* (Ker-Gawl.) Miers], the foliage seems at first sight to consist of a pair of opposite leaves upon a common peduncle the apex of which is continued and ends in three filiform branches. The correct interpretation of this arrangement is that the leaf is compound and consists of three leaflets, the terminal of which is modified as a branched tendril. The tendril after attachment to a support contracts spirally, and not only raises the stem but also permits a certain elasticity in the attachment of the liane to its support and thereby minimises the danger of damage from storms. The tips of the tendrils after attachment often become transformed into small disks.

The leaves of the species may be simple or compound and are exstipulate, though the development of small leaves in the axils of true leaves often simulate foliaceous stipules.

The flowers are arranged in terminal or axillary pairs or racemes or in corymbose fascicles. The calyx is of combined sepals with obscure lobes or teeth. The corolla is large and showy, zygomorphic and usually bell- or trumpet-shaped, less often cylindrical, rarely 2-lipped, 5-lobed. The stamens are five in number but the posterior one is usually rudimentary and represented by a small stipe. The other four are paired, two with long filaments, and two with short; a condition which is termed didynamous. The anther cells are usually divergent at the base.

The ovary is seated upon a disk which may be cupular or platter-shaped, and is two-celled. The ovules are numerous and are attached to axile placentas. The style is simple with two flattened stigmatic lobes. The fruit is usually a two-valved capsule.

In species of this genus whose life history has been studied it is found that the stigmas and pollen become mature at different times and that the stigma-lobes close before the pollen from the same flower can fertilise them. Cross fertilisation seems to be the rule in the genus and in the case of those species imported into India from abroad the agent of pollination seems to be absent in this country, for very few of our exotic species set fruit.



The Golden Shower (*Bignonia venusta* Ker.)
New Forest, Dehra Dun.

Photo by M. N. Bakshi.

KEY TO THE SPECIES.

Tendrils 3-partite.

Corolla cylindrical	...	...	...	<i>B. venusta.</i>
Corolla swollen upwards.				
Tendrils clinging by disks	...	...	...	<i>B. capreolata.</i>
Tendrils clinging by claws or hooks	...	...	...	<i>B. unguis-cati</i>

Tendrils simple.

Disk present; flowers rose with darker stripes; leaves shining	...	...	...	<i>B. speciosa.</i>
Disk absent; flowers pale mauve, purplish with a white or yellowish throat; leaves dull	...	...	...	<i>B. magnifica.</i>

***Bignonia venusta* Ker. [Pyrostegia venusta (Ker-Gawl.) Miers].**
Golden Shower.

(*venusta* is Latin for 'charming', 'beautiful').



Fig. 1.—*Bignonia venusta* Ker.

Description.—An evergreen plant climbing extensively by means of tendrils. Stems stout, angled. Leaves compound, consisting of two leaflets with a terminal branched tendril, or sometimes of three leaflets. Leaflets ovate or ovate-oblong, bluntly and shortly acuminate, wedge-shaped at the base, 2—4 in. long, glabrous on the upper surface, shortly and sparsely hairy beneath.

Flowers very showy, arranged in corymbose cymes or racemes, drooping. Calyx small, campanulate in shape, with five, very small, hairy teeth. Corolla tubular, 3 in. long, gradually expanding to the mouth where it ends in five linear lobes which are valvate in the bud (i.e., they touch by their margins), the point

of junction being very evident as each lobe has white villous margins. On opening the lobes curve backwards and form two lips, the upper of which is 2-, the lower 3-lobed. Stamens four, in pairs, with filaments of different lengths. The longer pair is well exserted from the tube, the shorter reaches the base of the lobes. Ovary linear, seated on a fleshy disk. Style very long, almost as long as the stamens. This plant does not produce fruit in this country.

Flowers.—Cold season.

Distribution.—Indigenous to Brazil, but now a very common cultivated plant in all tropical countries.

Gardening.—Probably no plant in the world presents so gorgeous an appearance as *Bignonia venusta* when in full bloom during Jan.—Feb. The plants are not fastidious as to soil but a good fibrous loam, to which one-third cow or sheep manure has been added, suits them admirably. Propagation is effected by cuttings of the wood taken in late spring and inserted in sand preferably under a bell jar. It is suitable for pergolas in the open, porches, verandahs and the like.

***Bignonia capreolata* Linn. [Doxantha capreolata (Linn.) Miers].**

Trumpet Flower. Cross Vine. Quarter Vine.

(*capreolata* is a Latin word meaning 'winding' or 'twining').



Fig. 2.—*Bignonia capreolata* Linn.

Description.—An extensively climbing, glabrous species. The older stems in section exhibit a perfect cross of four wedge-shaped insertions of bast in the wood. The leaves are opposite and compound, consisting of an ovate or oblong, acuminate and subcordate pair of stalked entire leaflets and a compound tendril which clings by small disks. Stipules are absent but accessory leaves or leaflets in some of the axils simulate foliaceous stipules.

The flowers are borne on pedicels which are arranged in fascicles of 2-5 on axillary spurs. The calyx is membranous, green, 2 in. long. The corolla is tubular with a stout limb, 2 in. long, yellowish red in colour, rather lighter within.

Flowers—March—April. Does not set fruit in Dehra Dun

Distribution.—This climber is indigenous in North America, but is now extensively grown as an ornamental plant in the tropics of the Old World.

Gardening—This handsome vine is very suitable for covering walls, embankments and the like. Propagated by cuttings or layers of half matured wood.

***Bignonia unguis-cati* Linn.**

Cat's Claw (in Latin *unguis cati*).

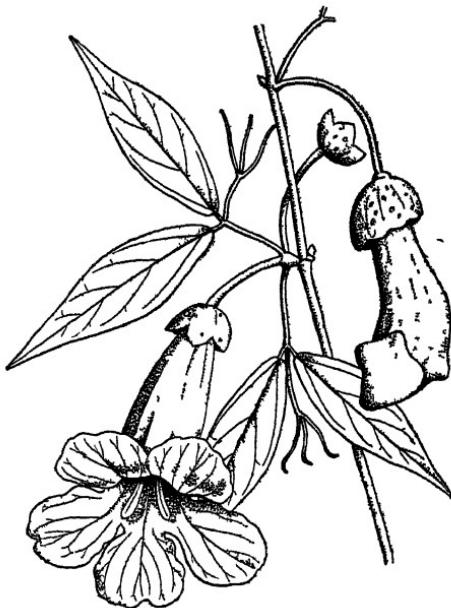


Fig 3.—*Bignonia unguis-cati* Linn.

Description.—An extensively climbing, slender, evergreen species. The leaves are opposite and compound, exstipulate. Leaflets 2, lanceolate or ovate-acuminate, cordate, 3 in. or less long; the terminal leaflet is represented by a three-partite claw-like

tendril, the arms of which do not form disks after attachment. The flowers, which are a beautiful clear yellow in colour, with deeper yellow lines in the throat, are borne in pairs seated on slender peduncles in the axils of the leaves. Calyx 5 in. long, obtusely 5-lobed, membranous, bowl-shaped, with conspicuous veins. Corolla with a short tube and broadly ventricose limb with spreading lobes, 2-4 in. across and 2-2.5 in. long. Ovary linear, .25 in. long, seated on a fleshy disk. Style curved, 1 in. long.

Flowers.—April. Occasionally a second flush in Aug. *Fruits*. July.

Distribution.—This climber is a frequently cultivated plant in India. It is a native of Argentina.

Gardening.—An extensive climber reaching the tops of the tallest trees and forming masses of foliage and yellow flowers in pendent bunches. It sows itself freely in Dehra and also probably elsewhere. Easily raised from seed or by layers or cuttings.

Bignonia speciosa R. Grah. [***Clytostoma callistegioides*** (Cham.) Baill.].

(*speciosa* is Latin for ‘handsome’).

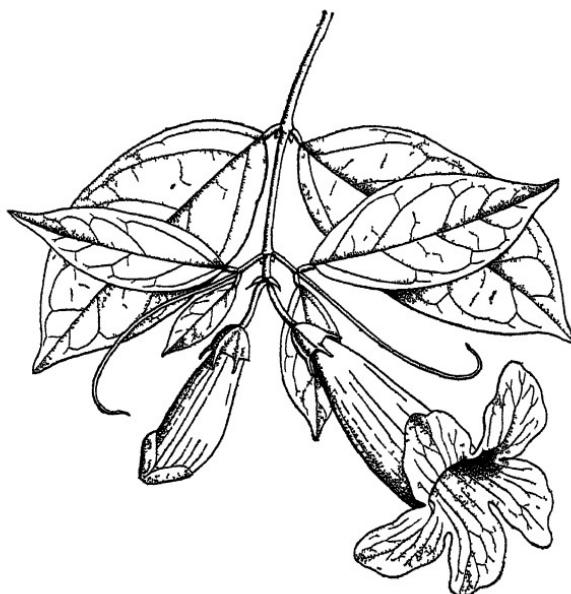


Fig. 4.—*Bignonia speciosa* R. Grah.

Description.—An evergreen shrub, extensively climbing by means of tendrils. Leaves opposite, compound, consisting of two opposite, stalked leaflets and a terminal unbranched tendril. Leaflets about 3 in. long, but may be longer, elliptic-oblong or ovate-acuminate

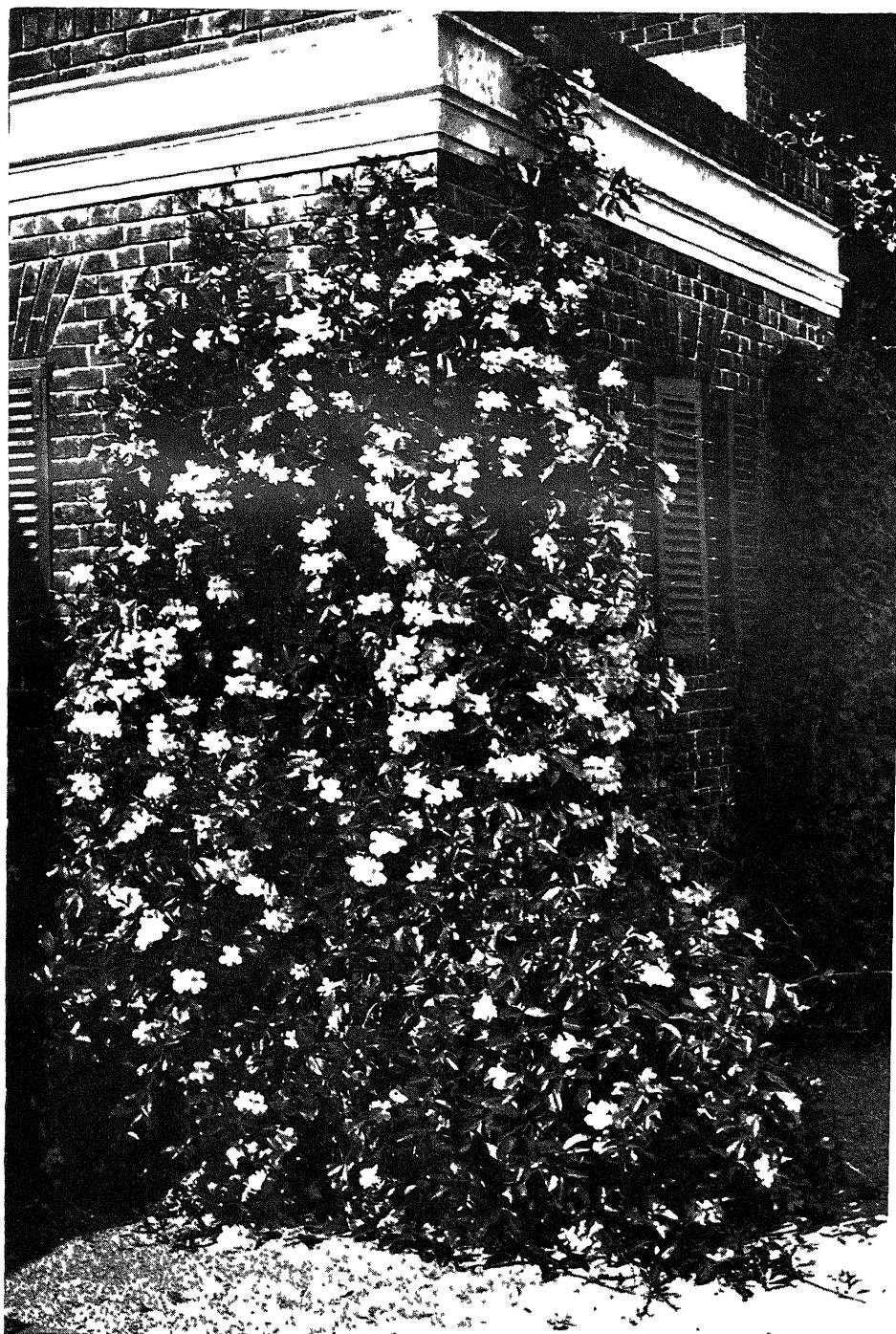


Photo by N. L. Bor

Bignonia speciosa R. Grah.
New Forest, Dehra Dun.



Photo by N. L. Bor

Bignonia speciosa R. Grah
New Forest Dehra Dun

in shape, glabious, shining, reticulated below; margins undulate; base subcordate rounded or acute.

Flowers large and showy, borne in pairs on a terminal peduncle. Calyx obliquely campanulate with 5 acute or subulate lobes. Corolla pubescent, about 3 in long, limb 3 in. broad, broadly ventricose from a short yellowish tube, lilac rose or pale purple in colour, streaked inside with darker purple veins. Lobes five, broadly ovate or orbicular, the upper reflexed. Ovary seated on a fleshy disk with crenulate margins. Stamens included, didynamous; anther cells much divaricate. Pod 2 5 in. long, shortly oblong, densely covered with short spines.

Flowers.—March—April. *Fruits*.—Cold season.

Distribution.—Indigenous to tropical America, but now widely cultivated in the tropics of both hemispheres.

Gardening.—This is a very showy and ornamental species best suited for training over trellis work or over fences and the like. Easily raised, like most other species of the genus, by layers.

Bignonia magnifica Bull. [*Arrabidaea magnifica* (Bull.) Sprague].



Fig. 5.—*Bignonia magnifica* Bull.

Description.—A climbing shrub with branches compressed when young, terete when old, rather rough to the touch. Leaves compound, opposite, consisting of 2 leaflets and usually a tendril. Leaflets opposite, obovate oblong, obtuse at the tip, attenuate at the

base, rather dull on both surfaces, 3-5 in. long by 1·75-2·5 in. wide, membranous, glabrous, entire, with a short petiolule 1 in. long; nerves compressed above, prominent below. Tendril issuing between the leaflets, hooked, up to 6 in. long.

Inflorescence of four-flowered, axillary or terminal, cymes. Flowers large, showy, almost sessile. Calyx gamosepalous, cupular-campanulate, very slightly narrowed above, olive green, truncate at the top or with a few teeth, shining within, dull without. Corolla large, up to 2·5 in. wide across the limb, purplish violet, mauve or light purple in colour, whitish or primrose in the throat with longitudinal purple veins. Tube tubular-infundibuliform, curved above the base, 2·5 in. long, 5-lobed, lobes orbicular, almost 1 in. in diameter. Stamens 4, didynamous, fifth a rudimentary stipe; filaments curved, inserted at the top of the narrow portion of the tube, swollen at the base and glandular, included; anthers widely divergent. Ovary superior, at the base of the tube; style 1-1·5 in. long with 2 stigmatic lobes.

Flowers.—Cold season. Does not set fruit in India.

Distribution.—Indigenous in Colombia, South America; now commonly cultivated in all tropical countries in the open and under glass in temperate climes.

Gardening.—It is a free flowering handsome climber, bearing large flowers of a delicate mauve changing to rich crimson, with the throat of a light primrose colour. Suitable for growing on arches, pergolas and the like. Easily raised by layers or cuttings.

(To be continued).

THE HOG-BADGERS (*ARCTONYX*) OF BRITISH INDIA.

BY

R. I. POCOCK, F.R.S.,

British (Natural History) Museum.

(*With a text-figure*).

Hog-badgers are not found in Peninsular India, but although widely distributed to the north and east of the Bay of Bengal are nowhere plentiful. As E. H. Peacock remarked they are of rare occurrence in Burma. A few only were collected by the Mammal Survey in that country and both Crump and Baptista failed to secure them in Bhutan, Sikkim and Nepal.

No detailed description of them is necessary since their general characters are well known; and the different kinds are superficially very much alike, being mainly distinguishable by size, by the luxuriance of the coat and by minor variations in colour, both the coat and colour being seasonally variable and the pattern of the head hardly ever quite alike in any two individuals. The skull and teeth are also subject to very remarkable individual variations, the skull more particularly in the degree of development of air-cells in the bones of the forehead and hind-palate which may alter its shape profoundly and the last two upper teeth differ more in size and shape within subspecific limits than in any other mammal known to me.

The literature relating to the Hog-Badgers reveals great divergence of opinion regarding the status and nomenclature of the many forms that have been described, chiefly on account of the varied application of the name *collaris*, symbolising the type-species of the genus *Arctonyx*.

In his account of the British Indian representatives Blanford, following Blyth, Anderson and W. L. Sclater, admitted two species, a larger, *A. collaris*, extending from the eastern Himalayas to Burma, and a smaller, *A. taxoides*, occurring in Assam and Arakan. Gray, however, had previously cited *taxoides* as a synonym of *collaris*. Wroughton, when dealing with the 'Survey' material, followed in 1914 Blanford's lead in adopting *taxoides* as the name for a valid species; but I have been unable to ascertain precisely what his conception of *collaris* was, except that he cited as representing it a ♀ specimen from Karen, which is obviously immature, and another, which I have not seen, from the Chin Hills. He inferred apparently from these that the total length of the skull does not exceed 135 mm. in *collaris*, whereas Blyth, Gray and

Blanford had included under that heading specimens with the skull surpassing 150 mm. in total length.

Accepting Wroughton's statement about the length of the skull in *collaris* and Anderson's erroneous assertion that the type of *isonyx* Horsfield came from Tibet, G. M. Allen, in his revision of the Chinese Hog-Badgers, took *collaris* for the name of a southern Chinese, Tibetan and N. E. Himalayan form, with a skull of approximately the length given by Wroughton and quoted as synonyms of it *albogularis* given by Blyth in 1853 to a Tibetan specimen and *obscurus* given by Milne Edwards in 1868-1874 to one from E. Tibet. Although Allen gave no opinion about the status of *tuxoides* or of the larger Hog-Badger identified by Blyth, Gray, Blanford and others as *collaris*, I infer that he would have regarded them as representing merely subspecies of *collaris*, since he assigned the Chinese Hog-Badgers to two subspecies of that species. At all events Osgood, who accepted Allen's designation of *collaris*, assigned the large Hog-Badgers of Annam, Laos, and the Malay Peninsula to a subspecies for which he adopted the name *A. collaris dictator*, Thomas.

Although there is not as yet, so far as I know, complete evidence of the intergradation of all the forms of Hog-Badger, I adopt the conclusion of my American colleagues that there is in Continental Asia but one species, *A. collaris*, represented by several subspecies; but I differ from them in the assignation of some of the names.

It has probably been my good fortune to see more examples of Hog-Badgers than any of my predecessors. The British Museum contains skins and skulls of all the described forms, except the north Chinese race *leucolæmus*. In addition it has been my privilege to examine the specimens in the Museum of the Bombay Natural History Society and in the Indian Museum, Calcutta and I am greatly indebted to the authorities of these institutions for the kind loan of them, especially to Dr. Baini Prashad, the Director for sending me the type of *taxoides* from Calcutta.

My conclusions regarding the British Indian Hog-Badgers is that there are two distinguishable races, a smaller, *collaris*, and a larger for which a new name seems necessary, although it contains specimens erroneously, in my opinion, assigned to *collaris* by several previous authors. The two may be briefly distinguished as follows:

- (a) Size small, head and body about 2 ft. long, condylobasal length of skull not known to reach 120 mm., less than 5 inches; teeth smaller. *collaris.*
- (b) Size larger, head and body about 2½ ft. long, condylobasal length of skull over 150 mm., or 6 inches in length; teeth larger. *consul* subsp. nov.

Arctonyx collaris collaris F. Cuvier.

Arctonyx collaris F. Cuvier, *Hist. Nat. Mamm.*, pt. 51, pl., 1825 and of some subsequent authors but only in part; and not *Arctonyx collaris collaris*, G. M. Allen, *Amer. Mus. Novit.*, no. 358, pp. 10-11, 1929 and *Mamm. China and Mongolia*, p. 404, 1938.¹

Arctonyx taxoides, Blyth, *Journ. As. Soc. Beng.*, 22, p. 591, 1853. Anderson, *Zool. Res. Yunnan*, p. 196, 1878; Blanford, *Mamm. Brit. Ind.*, p. 180, 1888; W. L. Sclater, *Cat. Mamm. Ind. Mus.*, pt. 2, p. 291, 1891.

Arctonyx isonyx (Hodgson MS.), Horsfield, *Proc. Zool. Soc.*, 1856, p. 398, pl. 1.

Arctonyx collaris turaiensis, Hodgson, *Cat. Mamm. etc. ed.*, 2, p. 7, 1863 (no description).

Locality of the type of *collaris*, 'the hills between Bhutan and India', cited by Wroughton as the Bhutan Duars; of *taxoides*, Assam; of *isonyx* and *turaiensis*, the Sikkim Tarai.

Distribution.—The Sikkim Tarai, Bhutan Duars, Assam and perhaps Chittagong.

Distinguished from the other British Indian race, which apparently replaces it in Burma, by its smaller size, the head and body being only about 2 ft. long or less, shorter tail and smaller skull, the length of which is only about 120 mm. or less; also by its noticeably thicker winter coat. From the Southern Chinese race *A. c. albogularis* by its shorter, less thickened winter coat and smaller skull the length of which in *albogularis* is about 135 mm.

I have only seen four specimens that I assign to this race, namely the skin of the type of *isonyx*, from the Sikkim Tarai, an immature skin from Darjiling (Calcutta Museum), the skin and the skull of the type of *taxoides* from Assam and of a specimen, received from the East India Co., entered as from 'Bengal' but marked on its stand as from Chittagong which was formerly included in that Province.

The restriction of the name *collaris* to this small Hog-Badger is based on the assumption that the type specimen from Bhutan Duars is probably racially the same as that of the type of *isonyx* from the Sikkim Tarai. I have seen no specimens from Bhutan and am not aware of a record of one from that district apart from Cuvier's account based on a description sent to him by Duvaucel of a living specimen exhibited in the menagerie at Barrackpore and stated to have been brought from the 'hills between Bhutan and India'. The type was probably not preserved and no measurements were given. But the skin of the type of *isonyx* is in the British Museum and in Hodgson's MS., where the specimen is said to have come from the Sikkim Tarai, there is a fairly good figure of the skull which from its muscular moulding appears to

¹ Since *collaris* is not, in my opinion, applicable to the Tibetan and Southern Chinese Hog-Badger, I adopt for that race the name *albogularis* Blyth, with *obscurus* Milne Edwards as a synonym; and, from an examination of the types, I entirely agree with Allen that the names *orestes* and *incultus* given by Thomas to Hog-Badgers from the Tsing Ling Mts., S. W. Shensi and from Chinteh in Anhwei respectively are also synonyms.

be adult. Its measurements, entered below, are taken from these drawings said to be two-thirds natural size. I have also seen the type, skin and skull, of *taxoides*. There is nothing that I can detect in the skin, as preserved, to separate it systematically from that of *isonyx*, although the ears, as stated by Blyth, seem to be a little smaller; and I do not attach to the cranial and dental characters, relied on by Blyth, Anderson and W. L. Sclater, the importance assigned to them by those authors. In the first place the skull is not fully adult, as it was stated to be, its basioccipital and naso-maxillary sutures being open and its temporal ridges 15 mm. apart. It is moreover abnormal in being 'undershot', the lower incisors projecting 5 mm. beyond the upper. The upper carnassial is admittedly unusual in shape, as W. L. Sclater said, although Blyth noted nothing peculiar about it; but the upper teeth of *Arctonyx* vary so remarkably individually in the same locality that the peculiarity is not, in my opinion, to be relied upon on the evidence of a single specimen.

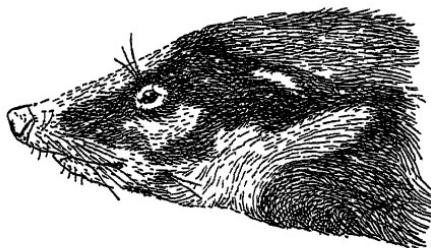
The external measurements in English inches of the specimens of this race were taken from dried skins, the type of *isonyx* is 'made up' in the conventional way from a formerly mounted specimen; that of *taxoides* is still mounted for exhibition. In these the dimensions were taken 'over the curves'. The third specimen from Bengal (? Chittagong) is now a flat skin, which was unstuffed a few years ago. They were probably stretched rather than shrunken by the manipulations to which they were subjected, which would make the dimensions of the head and body in life less rather than more than those indicated on the table.

The external measurements in English inches of *A. collaris collaris*, taken from skins, and of *A. c. consul*, taken in the flesh, are as follows:—

Name, locality and sex		Head and Body	Tail	Hind foot
<i>A. collaris collaris</i>				
Sikkim Tarai (<i>isonyx</i> , type)	ad. ♀	25	5	3
Assam (<i>taxoides</i> , type)	sub. ad. ♀	22½	5½	3
Bengal (Chittagong)	just ad ♀	21½	4½	3
<i>A. c. consul</i>				
Thaundaung, nr Toungoo (type)	ad. ♂	31	10½	4½
Thaundaung, nr Toungoo	yg. ad. ♂	25½	9½	4½
Moulmein (Tickell, MS.)	ad. ♂	30	9	4½

Arctonyx collaris consul subsp. nov.

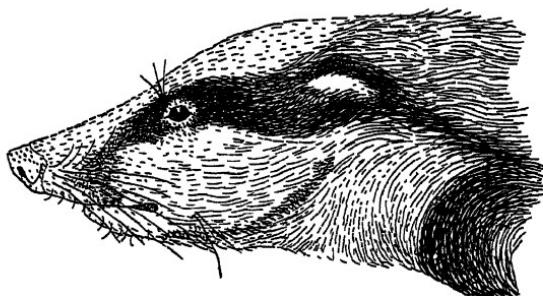
Arctonyx collaris of Horsfield, Blyth, Gray and also of Blanford, *Mamm. Brit. Ind.* p. 178, 1888 (excluding *isonyx* Hodgs. from synonymy); but not typical *A. collaris*, as identified above, nor *A. collaris collaris* G. M. Allen, *Amer. Mus. Novit.*, no. 358, p. 10, 1929.



A



B



C

- A. Head of *Arctonyx collaris collaris*, drawn from the type of *taxoides*.
- B. Head of *Arctonyx collaris consul*, drawn from the skin from Longpa in the Naga Hills in which the black of the 'mask' is exceptionally well developed.
- (These two figures show approximately the relative size of the head in the two British Indian races of the Hog-Badger.)
- C. Head of *Arctonyx collaris consul* drawn from the skin from Lockaw, Karenne, to illustrate the greatest reduction in the black of the 'mask' in the available specimens of the race.

Locality of the type:—Thaundaung near Toungoo, 4,500 ft. in Lower Burma (J. M. D. Mackenzie).

Distribution.—Assam, Chittagong, Burma at least from Mogok to N. Tenasserim.

Distinguished from *A. collaris collaris* by its considerably large size both in the head and body and in the skull, by its longer tail which is about one-third the length of the head and body and about twice the length of the hind foot and at least in its typical form by its less luxuriant winter coat. It is also larger than the Southern Chinese and Tibetan race *A. collaris albogularis* Blyth (= *obscurus* M. Edw.) and has the winter coat much thinner; but it is smaller on the average both in its body dimensions and skull and has the tail relatively longer than in the provisionally admitted Annamese race, *A. collaris annaeus* Thos.¹ and still smaller, in the skull, than the Malayan race *A. collaris dictator*.²

The following is a list of the localities of the specimens I assign to this race, with the altitudes, where recorded, and the collectors' names. The only specimens collected for the Survey were those secured by J. M. D. Mackenzie, H. W. Wells, and J. P. Mills; and the only other specimens in the British Museum are the one presented by E. W. Oates and a skull from 'Bengal' (Hardwicke). The rest are in the collections of the Indian Museum, Calcutta, and of the Bombay Natural History Society.

Moulmein (Tickell MS., specimen not preserved); Lockaw in Karenri, 2,500 ft. (E. W. Oates); Thaundaung, near Toungoo, 4,500 ft. and 30 miles N. W. of Kindat (J. M. D. Mackenzie); Ruby Mines, Mogok (H. C. Smith); Falam in the Chin Hills, 5,000 ft. (J. M. Wright), Chittagong Hills (J. Jarbo); Hot Springs in the Jaintia Hills, 2,400 ft. (H. W. Wells); Longpa in the Naga Hills, 3,000 ft. (J. P. Mills) and Assam (Capt. Bulter)³.

The skins from Assam are immature, as shown by their skulls, and the age of the skin from the Chittagong Hills cannot be determined because it has no skull. This is unfortunate because it is precisely in those districts that Hog-Badgers intermediate in size between the two races here admitted may be found, if they exist. The ascription of these specimens to *A. c. consul* is there-

¹ Thomas (*Ann. Mag. Nat. Hist.* (9) 7, p. 524, 1921) based on a young ♂ from Nhatrang, Annam. See also Osgood (*Field Mus. Nat. Hist. Zool.*, 18, p. 263, 1932) who made *annaeus* a synonym of *dictator* and very likely correctly.

² Thomas (*Ann. Mag. Nat. Hist.*, (8), 5, p. 424, 1910) based on an old ♀ from Trang, in the Malay Peninsula.

³ The specimen from N.-W. of Kindat was identified by Wroughton as probably referable to *A. c. collaris* (*Journ. Bomb. Nat. Hist. Soc.*, 24, p. 768, 1916). It is a male shown by its skull, which is 139 mm. in condylobasal length, to be obviously immature. In the note accompanying it Mackenzie, guided by Blanford's and Wroughton's nomenclature, stated that he secured examples of *collaris* and *taxoides* in the Kabaw Valley and inferred that both occur in the Chin Hills. The specimen he identified as *taxoides* mysteriously disappeared and never, as Wroughton regretfully remarked, reached the British Museum for examination. I suspect it was a still younger example of *consul*.

fore only an inference based on the size of the young skulls from Assam and of the skin from Chittagong. Possibly, however, the Assamese specimens, especially the one from the Naga Hills may belong to the Southern Chinese race, *A. c. albogularis*, which is nearly intermediate in size between the other two.

The external measurements of the two examples from Toungoo entered in the table (p. 464) were taken in the flesh by Mackenzie and those of the one from Moulmein by Tickell as recorded in his MS. For the evidence of the differences in the dimensions between this race and the earlier described *annaeus* from Annam and Laos I am indebted to Dr. Osgood who in 1932 recorded those of a male from Laos and later kindly sent me (*in litt.*) those of three examples from Thateng in Annam. In these the head and body range from 36½ to 44 in., the average being from 9 to 10 in. greater than in *consul*, the tail from about 8½ to 9½ in., a little less than in *consul*, and the hind foot from 5 to 5 4/5 in. on the average about 1 in. longer than in *consul*. The flesh measurements of the type of *dictator* are very nearly the same as of *annaeus*. The very considerable difference in the length of the head and body between *consul* and *annaeus* are, in my opinion, too great to be assigned to individual variation or to be explained away by the 'personal equation' of the collectors or by different methods of measuring.

The differences in the size of the skulls is much less marked. In the three adult ♂ skulls of *consul* the condylobasal length varies from 152 to 154 mm. In three adult, unsexed specimens of *annaeus* from Thateng, Annam, the same length, as Dr. Osgood informs me, is 159 mm., but in an old ♂ from Phong Saly, Laos, it is only 155 mm., as he recorded in 1932. On the other hand the condylobase in the ♀ type of *dictator* is 165 mm. and in another adult ♀ from Sai Yoke, S. W. Siam, it is 164. It is on the evidence of the larger size of these two ♀ skulls that I provisionally regard *dictator* as a distinct race from *annaeus*.

Some structural features in the skulls of *consul* entered in the table may be noted. The ad. ♂ skull of the type has no trace of sutures and its sagittal crest is 8 mm. high. The actual length of the younger skull from Toungoo is uncertain because the beast was killed by a knock on the head which smashed the back of the skull, but the mandible is only 7 mm. shorter than in the adult, 102 mm. as compared with 109 mm. It has all the sutures open, no sagittal crest, the temporal ridges being 10 mm. apart at their nearest point close to the middle of the crown, and the zygomatic and mastoid widths are much less, the mastoids being respectively 92 and 83 mm. These differences are a question of age. Very noticeable, too, are the differences in the size of the teeth. Those of the type, it is true, are flattened by wear, but quite clearly they were much smaller, before being worn, than those of the younger specimen.

The skull from 'Bengal' (Hardwicke) belonged to the specimen

represented by Gray as *Mydaus collaris* (Hardwicke's *Illustr. Ind. Zool.*, 1, pls. 6 and 7, 1830) and twice subsequently figured by him as *Arctonyx collaris* (*Proc. Zool. Soc.*, 1865, p. 681 and *Cat. Carn. etc.* p. 124, 1869). The exact locality of the specimen is quite uncertain; but it may be suspected to have come from one of the districts of the Province lying in those days to the east of the Bay of Bengal. It is very like the skull of the type of *consul* from Toungoo, but has a lower sagittal crest, only 3 mm. high, a lower-projecting, hooked mastoid process and bigger teeth, more like those of the young Toungoo specimen.

The precise dimensions of the skull from Moulmein are doubtful. They have been calculated from Tickell's figures stated to be 5/8 natural size. This makes the condylobasal length as entered, but according to Tickell the total length of the skull was $6\frac{1}{4}$ in. or 158 mm., and this happens to be the condylobasal length which in this skull alone of all I have seen exceeds the length from the occipital crest to the premaxillæ. If 158 mm. is correct, the skull is almost exactly the same length as those of *annaeus* from Thateng, Annam, referred to above. In that case the Moulmein specimen was intermediate between the two races, not a surprising thing considering its locality.

The skull is also singular for the exceptional widths of the interorbital area and of the muzzle, which give an unusually massive look to its facial portion. It is highly possible, however, that the peculiarities above mentioned are due to this Hog-Badger having been reared in captivity, a condition known to produce profound effects on the skulls of many Carnivora. Tickell stated that he had the animal alive 'for two years after receiving it from a monastery where it had been kept as a pet from early cubhood.

All the ♀ skulls I have seen are immature. The largest from Falam in the Chin Hills (Bombay Museum), with an estimated condylobasal length of about 140 mm., has the postdental area of the palate greatly inflated by air-cells and the frontal region also elevated by the same factor. The skull from Lockaw, Karennei has the same regions similarly expanded, but the frontal area is also swollen laterally, the whole area being unusually wide as compared with the end of the muzzle. It is also remarkably 'undershot', more so than in the type of *taxoides*, the lower incisors overlapping the upper by 7 mm. The skull is smashed at the back but I estimate its condylobasal length to have been about 128 mm.; but judging from the length of the mandible, 93 mm., the normal condylobasal length would have been about 135 mm., making allowance for the abbreviation of the upper jaw which has resulted in the 'undershot' condition of the muzzle. The measurements of the very young ♀ skull from the Jaintia Hills, which has all its sutures open and its second teeth imperfectly erupted, have been entered for comparison with those of the adult or nearly adult skulls of *collaris* which are a trifle shorter in condylobasal length and well moulded muscularly.

SKULL MEASUREMENTS OF THE TWO BRITISH INDIAN RACES
 OF THE HOG-BADGER (*Arctonyx*).

Name, locality and sex	Total length	Cond. bas. length	Zygomatic width	Post. Orb. width	Int. Orb. width	Max. width	pm*	m ¹	m ₁
<i>A. collaris collaris</i>									
'Bengal' just ad. ♀	122	114	62	24	24	22 $\frac{1}{2}$	7	13	14
Assam (<i>taxoides</i> , type) sub. ad. ♀	114	...	57	24	21	23	7	13	14
Sikkim Tarai (<i>isonyx</i> , type) ad. ♀	114 $\frac{1}{2}$	110 $\frac{1}{2}$	56	22 $\frac{1}{2}$	22 $\frac{1}{2}$	21 $\frac{1}{2}$	6	13	14
<i>A. c. consul</i>									
Toungoo (type) ad. ♂	158	154	91	37	37	33	9 $\frac{1}{2}$	15	17
Toungoo yg. ad. ♂ (158 $^{+}$ -)		...	83	...	37	33	10 $\frac{1}{2}$	18	20
'Bengal' ad. ♂	157	152	93	35	36	33	10	18 $\frac{1}{2}$	19
Moulmein (Tickell MS.) ad. ♂	152	153 $\frac{1}{2}$	94 $\frac{1}{2}$	35 $\frac{1}{2}$	41 $\frac{1}{2}$	40	9 $\frac{1}{2}$	14 $\frac{1}{2}$	19 $\frac{1}{2}$
Karennei, Lower Burma yg. ♀	...	(128 $^{+}$ -)	74	41	36	29	9	14	14
Jaintia Hills, Assam very yg. ♀	122	118	57	32	32	24	9	15	15

THE BIRDS OF CENTRAL INDIA.

BY

SÁLIM ALI.

WITH NOTES BY HUGH WHISTLER.

PART II.

(Continued from page 106 of this Volume).

Picus xanthopygæus (Grey). The Little Scaly-bellied Green Woodpecker.

Specimens collected: *Bhōpāl*: 66♂ 11-1-38 Sānchi.

Elsewhere not noted.

Rare.

Dryobates mahrattensis (Latham). The Yellow-fronted Pied Woodpecker.

Specimens collected: *Bhōpāl*: 23♂ 8-1-38 Sānchi, 76♂ 14-1-38 Dōdi, 196♂, 197♀ 25-1-38 Mathār. *Gwālior*: 287♀ 15-2-38 Kūno, 884♂ 19-9-38 Bāgh. *Indore*: 730♀ 27-8-38 Bijwār.

Elsewhere noted: *Gwālior*: Satanwāra, Narwar Fort, Sūrwāya, Bhind.

[As pointed out in the Eastern Ghats Survey (*J.B.N.H.S.*, xxxvii, 288) the recognition of 2 races of this woodpecker is only really feasible if birds from the extreme North-west and birds from the South of India are compared. This series can only be considered intermediate. 287♀ from Kūno (wing 103.5') would pass as a typical *aurocristatus*. No. 884♂ from Bāgh (wing 99 mm.) would pass as *mahrattensis mahrattensis*. But with them must be considered the 3 birds from Mhow collected by Briggs (*J.B.N.H.S.*, xxxv, 394) which were certainly intermediates, whilst the present *Bhōpāl* series (viz. 3♂♂ wing 105, 107, 101 mm., and 1♀ 101 mm.) are the size of *aurocristatus* and the colour of *mahrattensis*. H. W.]

Common. Nest-hole on underside of horizontal mango branch, about 4 ft. from ground, containing apparently half-grown chicks, 16 April (Bhind); both parents feeding. A specimen found dead under a tree after severe hailstorm overnight, Mathār 25 January.

Dryobates hardwickii hardwickii (Jerdon). The Southern Indian Pigmy Woodpecker.

Specimens collected: *Gwālior*: 859♂ 15-9-38 Amjhēra. *Dhār*: 800[♀], 801♂ 6-9-38 Gūjri, 844♂ 11-9-38 Māndū.

Elsewhere noted: *Bhōpāl*: Mathār, Jaithāri.

Almost invariably present in mixed hunting parties that contain *Sitta castanea*.

Brachypterus benghalensis benghalensis (Linn.) The Golden-backed Wood-pecker.

Specimens collected: *Bhōpāl*: 10♂ 7-1-38, 21♂ 8-1-38 Sānchi, 132♀ 18-1-38 Dōdi. *Gwālior*: 260♂ 12-2-38 Kūno, 642♂ 12-4-38 Chandēri. *Indore*: 695♂ 23-8-38 Bijwār.

Elsewhere noted: *Gwālior*: Gwālior Fort, Sūrwāya.

Fairly common.

Chrysocolaptes festivus (Bodd). The Black-backed Woodpecker.

Specimens collected: *Indore*: 749♀ 30-8-38, 750♂ 31-8-38 Chōral.

Elsewhere noted: Chandēri.

lynx torquilla torquilla (Linn.) The European Wryneck.

Specimens collected: *Gwālior*: 301♀ 19-2-38, 318♀ 20-2-38 Kūno, 578♂ 29-3-38 Badarwās.

Elsewhere noted: *Bhopal*: Dödi. *Dewas*: Near town.

Earliest date 23 September; latest 29 March. Usually solitary. Flight and habit of twitching wings on alighting very finch-like.

Thereiceryx zeylanicus caniceps (Franklin). The Northern Green Barbet.

Specimens collected: *Bhōpāl*: 200 ♂, 201 ♀ 26-1-38 *Mathār*. *Gwālior*: 623 ♀ 7-4-38 *Chandēri*.

Elsewhere not noted.

[Nos. 200 and 201 with wings of 116.5 (♂) and 115 (+) respectively clearly belong to the race *caniceps*. No. 623 (♀ wing 121.5) from further north, however, is as one would expect, considerably closer to *T. z. kangrae* (cf. *J.B.N.H.S.*, xxvii, 515) and is best regarded as an intermediate.—H.W.]

Xantholoëma haemacephala indica (Latham). The Indian Crimson-breasted Barbet.

Specimens collected: *Bhōpāl*: 67 ♀ 11-1-38 *Sānchi*. *Gwālior*: 384 ♀ 28-2-38 *Satānwāra*, 445 ♂? 8-3-38 *Narwar* Fort.

Elsewhere noted: *Bhōpāl*: *Bhōpāl* City, *Jaithāri*. *Gwālior*: *Sūrwāya*. *Indore*: *Bijwār*, *Chōral*. *Dhār*: *Māndū*.

Not common. Largest ovarian follicle of specimen 28 February 5 mm.

Cuculus canorus ssp. The Cuckoo.

Specimen collected: *Dhār*: 829 ♂ juv. 9-9-38 *Māndū*.

Elsewhere not noted.

[This young cuckoo is in juvenile plumage and agrees very well, allowing for the individual variation which is common in juveniles, with specimens of the dark phase from the Western Himalayas. It therefore presumably belongs to the typical form. It will be remembered that Briggs procured adult cuckoos at Mhow in June and July which, from the state of their organs, appeared to be breeding and it is quite likely therefore that this juvenile was hatched in the neighbourhood where it was collected—H.W.]

Hierococcyx varius (Vahl). The Common Hawk-Cuckoo.

Specimen collected: *Gwālior*: 868 ♀ juv. 16-9-38 *Sardārpūr*.

Elsewhere noted: *Gwālior*: *Chandēri*, *Indore*: *Bijwār*. *Dhār*: *Gūjri*.

Not noted in *Bhōpāl* or *Gwālior* between 4 January and 13 April when the first in Central India was heard and seen. Not common, but possibly overlooked when silent.

Cacomantis merulinus subsp.? The Plaintive Cuckoo.

No specimens.

Noted: *Indore*: *Bijwār*. *Dhār*: *Gūjri*, *Māndū*.

Silent and not observed between January and May.

Clamator jacobinus pica (Hempr. & Ehr.) The Pied Crested Cuckoo.

Specimens collected: *Dhār*: 852 ♂ 13-9-38 *Māndū*. *Gwālior*: 867 ♂ 16-9-38, 877 ♂ 17-9-38 *Sardārpūr*.

Elsewhere noted: *Dhār*: *Gūjri*, *Gwālior*: *Gwālior* Fort, *Tānda* near *Bāgh*. *Indore*: *Bijwār*, *Chōral*, *Simrōl*.

Not noted during the period from January to May. Fairly common in August/September. 877 was a young bird with imperfectly ossified skull. Testes of 852 6 x 4 mm.

Eudynamis scolopaceus scolopaceus (Linn.) The Indian Koel.

Specimens collected: *Gwālior*: 676 ♂ 19-4-38 *Bhind*. *Indore*: 767 ♀ juv. 1-9-38 *Chōral*.

Elsewhere noted: *Gwālior*: *Shivpūri*, *Gūna*, *Rūthiāi*.

[No. 767 is a juvenile female and it has the characteristic blackish plumage, far darker on the upper parts, throat and breast than the adult ♀ which I have already remarked on (*Ibis*, 1937, p. 408) as being obviously a protective device to avoid wakening any suspicions in the foster parents.—H.W.]

Before the beginning of April only the high pitched *Kück-kück-kück* was heard and the birds were silent on the whole. The regular calls or crescendo 'songs'—*kū-oo*, *kū-oo* etc. were fairly common in April, and also heard in

August/September when they were not common and apparently on the wane. 676 had testes enlarged to 9x7 mm. A nearly full-fledged juvenile being fed by House Crows in nest on 23 August!

Taccocua leschenaultii leschenaultii Lesson. The Southern Sirkeer Cuckoo.

Specimens collected: *Bhōpāl*: 129 ♂ 18-1-38, 143 ♀ 19-1-38 Dōdi; 161 ♂, 162 ♂ Mathār. *Gwālior*: 469 ♂ 13-3-38 Narwar Fort. *Indore*: 720 - 25-8-38 Bijwār.

Elsewhere noted: *Bhōpāl*: Jaithāri, *Gwālior*: Sūrwaya, Badarwās, Bhind, *Dhār*: Māndū.

[In *J.B.N.H.S.*, xxxv, 396 I identified two birds collected by the Rev. Frank S. Briggs as the Northern race *sirkee*, but they must now be considered afresh with the series obtained by the Survey. In colour the series is variable. In size, however (6♂♂ wing 146-157 mm., 2 ♀♀ wing 153-158 mm.) they are so much smaller than the largest *sirkee* (North Punjab 5 ♂♂ wing 160-166; 5 ♀♀ 160-167 mm.) that I feel they might be attributed to *leschenaultii*, although somewhat intermediate in character, even the Narwar bird.—H.W.]

Common. In dry stony grass-and-thorn jungle. 720 (25 August) with white-shelled oviduct egg.

Centropus sinensis parroti Stres. The Southern Crow-Pheasant.

Specimens collected: *Gwālior*: 403 ♂ 2-3-38 Satanwāra.

Elsewhere noted: *Bhōpāl*: Bhōpāl City and Environs, Sānchi, Dōdi. *Gwālior*: Kūno, Narwar Fort, Sūrwaya, Gūna. *Indore*: Indore City and Environs. *Dhār*: Gūjri.

[♂ wing 201 mm. Interscapulars black; lower wing coverts chestnut and black mixed.—H.W.]

Psittacula eupatria nepalensis (Hodgs.). The Large Indian Paroquet.

Specimen collected: *Gwālior*: 271 ♀ 14-2-38 Kūno (Wing 205; tail 301 mm)

Elsewhere noted: *Bhōpāl*: Mathār, Jaithāri. *Gwālior*: Narwar, Badarwās, *Dhār*: Māndū.

Breeding in January and February. Specimen (14 February) had soft ovarian eggs. Juveniles about a month old taken from hole in tree 25 January.

Psittacula krameri borealis Neum. The Eastern Rose-ringed Paroquet.

Specimens collected: *Bhōpāl*: 123 ♀ 18-1-38 Dōdi; 254 ♂ 2-2-38 Jaithāri.

Elsewhere noted: *Bhōpāl*: Bhōpāl City, Dewānganj, Sānchi, Mathār. *Gwālior*: Kūno, Satanwāra, Sūrwaya, Badarwās, Chandāri, Bhind, Bāgh. *Indore*: Indore City, Bijwār, Chōral, Mhow. *Dhār*: Māndū.

[The specimens are of course really intermediate but in measurement they just reach the minima of Punjab birds. I have already suggested (*J.B.N.H.S.*, xxxvii, 752) an arbitrary boundary between the 2 races at 20° N. latitude so these can be called *borealis*.—H.W.]

Common. Breeding in January and February. Ovary of 123 granular; testes of 254 19×8 mm.

Psittacula cyanocephala bengalensis (Forst.). The Eastern Blossom-headed Paroquet.

Specimens collected: *Bhōpāl*: 149 ♂, 150 ♀, 151 ♂, 152 ♀ 21-1-38 Mathār.

Elsewhere noted: *Bhōpāl*: Sānchi, Jaithāri. *Gwālior*: Satanwāra, Narwar Fort, Sūrwaya, Badarwās, Chandāri, Bhind, Sardārpur, Bāgh. *Dhār*: Gūjri.

Common in dry teak and *kher* forest. Breeding or about to breed in January. Largest ovum of 150 2 mm. in diameter; testes of 149 7×5 mm.

Coracias benghalensis benghalensis Linn. The Indian Roller.

Specimen collected: *Bhōpāl*: 54 ♂ 10-1-38 Sānchi.

Elsewhere noted: *Bhōpāl*: Dōdi. *Gwālior*: Kūno, Satanwāra, Sūrwaya, Bhind.

[This ♂ with wing 188 mm. clearly belongs to the Northern race. This is another of those birds which intergrade from north to south and I have already suggested (*J.B.N.H.S.*, xxxvii, 755) that the division between the races should be arbitrarily fixed along 20° N. Lat.—H.W.]

Met with sparingly.

Merops orientalis orientalis Latham. The Common Indian Bee-eater.

Specimens collected: *Bhōpāl*: 175 ♂, 176 ♀ 23-1-38 Mathār. *Gwālior*: 544 ♀ 25-3-38 Badarwās.

Elsewhere noted: *Bhōpāl*: Bhōpāl City and Environs, Sānchi, Dōdi. *Gwālior*: Satanwāra, Narwar Fort, Sūrwāya, Badarwās, Amjhēra. *Indore*: Indore City and Environs, Bijwā, Chōral, Dhār: Gūjri.

Not uncommon, but curiously sparse and local. 544 had a granular ovary and on that date (25 March) a small colony was busy digging nest-tunnels in earth bank of Sind River.

Merops superciliosus javanicus Horsf. The Blue-tailed Bee-eater.

Specimens collected: *Gwālior*: 679 ♂ 19-4-38 Bhīnd. *Indore*: 787 ♂, 788 ♂? 5-9-38 Mandlēshwar. *Dhār*: 834 ♀, 835 ♂ 10-9-38 Māndū.

Elsewhere noted: *Gwālior*: Gwālior Fort, Amjhēra, Shīvpūri. *Indore*: Mhow.

Not met with in Central India between 4 January and 19 April. Fairly common in August, September. Testes of 679 (19 April) 7×4 mm.; 788 (5 Sept.) young of the season with imperfectly ossified skull.

Ceryle rudis leucomelanura Reichenbach. The Indian Pied Kingfisher.

Specimens collected: *Bhōpāl*: 96 ♂ 15-1-38 Dōdi. *Dhār*: 818 ♀ 7-9-38 Gūjri.

Elsewhere noted: *Bhōpāl*: Sānchi, Bhōpāl Lake. *Gwālior*: Satanwāra, Gūna, Rūthiāi, Chandēri. *Indore*: Bijwār.

Testes of 96 (15 January) 2×8 mm. Nest 4 February! Ovary of 818 (7 Sept.) granular.

Alcedo atthis taprobana Kleinschm. The Common Ceylon Kingfisher.

Specimen collected: *Bhōpāl*: 100 ♂ 15-1-38 Dōdi.

[This is a very blue specimen with a long beak (46 mm. from skull) which I cannot separate from *taprobana* of South India. There are 4 birds in the British Museum from Mt. Aboō which also seem to be very close to *taprobana*. Yet other specimens from localities like Neemuch, Poona, Saugor, Western Khandesh, Khandala and Matheran are *benghalensis*. The individual and subspecific differences of this species are very difficult to understand, partly because one so seldom meets with a series of known breeding birds from any area, and partly, no doubt, because being entirely dependent on water supply in which local rain and drought play such an important part, the individual's movements may be very erratic and outside of the ordinary rules of migration.—H.W.]

Alcedo atthis bengalensis Gmelin. The Common Indian Kingfisher.

Specimens collected: *Bhōpāl*: 31 ♀ 9-1-38 Sānchi. *Indore*: 747 ♂ 30-8-38 Chōral.

Elsewhere noted: *Gwālior*: Gūna, Rūthiāi, Chandēri. *Indore*: Bijwār. Singly or pairs at tanks and streams.

Ramphalcyon capensis gurial (Pearson). The Brown-headed Stork-billed Kingfisher.

Specimens collected: *Bhōpāl*: 134 ♀ 19-1-38 Dōdi. *Indore*: 721 ♂ 25-8-38 Bijwār.

Elsewhere noted: *Bhōpāl*: Bhōpāl Lake, Sānchi, Jaithāri. *Gwālior*: Kūno, Rūthiāi, Chandēri (Panchamnagar).

Fairly common. Singly or pairs on wooded streams. Largest ovarian follicle of 134 (19 January) 2 mm. diam. Testes of 721 (25 August) 9×5 mm.

Halcyon smyrnensis smyrnensis (Linn.). The White-breasted Kingfisher.

Specimens collected: *Bhōpāl*: 65 ♂ 11-1-38 Sānchi, 171 ♀ 22-1-38 Mathār. *Indore*: 748 ♀ 30-8-38 Chōral.

Elsewhere noted: *Gwālior*: Rūthiāi, Chandēri (Panchamnagar). *Indore*: Bijwār.

Not uncommon.

Tockus bīrostris (Scopoli). The Common Grey Hornbill.

No specimens.

Noted: *Bhōpāl*: Sānchi, Jaithāri. *Gwālior*: Satanwāra, Sūrwāya, Amjhēra. *Indore*: Bijwār. *Dhār*: Māndu.

Common.

Upupa epops epops Linn. The European Hoopoe.

Specimen collected: *Gwālior*: 369 ♀ 27-2-38 Satanwāra.

[Wing 142.5 mm. and pale in colour, being evidently a migrant of the typical form.—H.W.]

Upupa epops ceylonensis Reichb. The Ceylon Hoopoe.

Specimen collected: *Bhōpāl*: 117 ♂ 17-1-38 Dōdi.

[Wing 131 and richly coloured; evidently belonging to the resident form.—H.W.]

Elsewhere noted (subspecies?): *Bhōpāl* City. *Gwālior*: Kūno, Gwālior Fort, Bhīnd, Shīvpūri. *Dhār*: Gūjri.

369 had a granular ovary! On the same date another pair was interested in a hole in a masonry archway. On 17 April one was observed carrying food to nest.

Apus melba melba (Linn). The Alpine Swift.

Specimen collected: *Dhār*: 778 ♂ juv. 4-9-38 Gūjri.

Elsewhere noted: *Bhōpāl*: Jaithāri. *Gwālior*: Satanwāra. *Dhār*: Māndu.

[The specimen is a little small (wing 214 mm. ♂) for the typical race but it is certainly too pale for *A. m. bakeri* and it agrees with my series from N.-W. India. The skinner has noted on the label that the skull was soft and if this is correct the small size might be put down to its being a juvenile specimen. The wing is in moult, and according to the *Handbook of British Birds*, ii, 244, the wing is probably not moulted at the post-juvenile moult. Adult and juvenile Alpine Swifts are, however, very difficult to separate on plumage and it may be that the *Handbook* is wrong about the post-juvenile moult.—H.W.]

Small numbers usually seen hawking high over fired grass jungle. A colony (nesting?) about the enormous rock scarps and valley at Kānkra Khu, Māndu.

Apus affinis affinis (Gray). The Common Indian House-Swift.

Specimens collected: *Gwālior*: 481 ♀, 482 ♂ 14-3-38 Narwar Fort. *Indore*: 742 ♀ 30-8-38 Chōral.

Elsewhere noted: *Gwālior*: Satanwāra, Chandēri, Gwālior Fort. *Indore*: Bijwār, Mahēshwār. *Dhār*: Gūjri, Māndu. *Bhōpāl*: Bhōpāl city, Mathār, Jaithāri.

Common.

Hemiprocne coronata (Tickell). The Indian Crested Swift.

Specimens collected: *Bhōpāl*: 164 ♂, 165 ♂, 166 ♀, 167 ♀ 22-1-38 Mathār, 199 ♀ 25-1-38. *Indore*: 745 ♂, 746 ♀ 28-8-38 Chōral.

Elsewhere noted: *Bhōpāl*: Jaithāri. *Gwālior*: Chandēri. *Indore*: Bijwār. Gonads of January specimens maturing. ♂ ca 7×5 mm.; ♀ largest ovum 2 mm. Patchy, but not uncommon. Usually over teak and dry forest.

Caprimulgus indicus indicus Latham. The Indian Jungle Nightjar.

Specimens collected: *Gwālior*: 644 ♂ 12-4-38 Chandēri.

Testes 5×4 mm. Chasing and courtship in progress.

Caprimulgus monticulus monticulus Franklin. Franklin's Nightjar.

Specimens collected: *Bhōpāl*: 52 ♀ 10-1-38 Sānchi. *Gwālior*: 399 ♀ 28-2-38 Satanwāra, 484 ♂ 15-3-38 Narwar Fort.

Elsewhere noted: *Gwālior*: Chandēri.

Common. 399 breeding 28 February; largest ovum 5 mm. diam.

Caprimulgus asiaticus asiaticus Lath. The Common Indian Nightjar.

Specimens collected: *Bhōpāl*: 75 ♂ 14-1-38, 107 ♀, 108 ♂ 17-1-38 Dōdi. *Dhār*: 848 ♀ 12-9-38 Māndu.

Elsewhere noted: *Gwālior*: Narwar Fort, Chandēri.

[These specimens, as well as 2 in my collection obtained by Briggs at Mhow, all belong to the grey phase. No. 848 is undergoing a complete moult.—H.W.]

Common. Noisy March/April; silent August September.

Tyto alba subsp.? The Barn Owl.

No specimens.

Noted only at Māndū, Dhār State, (Sept. 38) among ruins.

Asio flammeus flammeus (Pontopp.) The Short-eared Owl.

Specimen collected: Bhōpāl: 112 ♂ 17-1-38 Dōdi.

Elsewhere not noted.

Solitary at base of bush in stony scrub country. Stomach contained field rat.

Strix ocellata (Lesson). The Mottled Wood-Owl.

No specimens.

Noted: Bhōpāl: Māthār. Indore: Bijwār, Chōral. Dhār: Gūjri.

Apparently not uncommon.

Ketupa zeylonensis leschenault (Temm.). The Bengal Brown Fish-Owl.

Specimen collected: Gwālior: 630 ♂ 8-4-38 Chandēri (Betwa River).

Elsewhere noted: Bhōpāl: Mathār. Gwālior: Sūrwāya.

Stomach of specimen contained remains of *Varanus* lizard, ca. 12 inches long.

At Mathār (Narbada Valley, Bhōpāl) was heard the long-drawn kite-like whistle of what I take to be some sort of owl. It was in a densely bamboo covered forested ravine. The bird never gave a glimpse of itself, but the call kept moving farther and farther away as approached. I have heard this same or a closely resembling whistle, confirmed to be emanating from some owl of about the size of a kite, in the Biligirirangan Hills on the Mysore-Coimbatore border.

Otus (bakkamoena?) The Collared Scops Owl.

No specimens.

The mellow *what?.....what?* calls were heard in Gwālior State at Kūno, Narwar Fort and Chandēri.

Athene brama indica (Franklin). The Northern Spotted Owlet.

Specimens collected: Bhōpāl: 48 ♀ 10-1-38, 68 ♀ 11-1-38 Sānchi. Gwālior: 311 ♀, 312 ♂ 19-2-38 Kūno; 625 ♀ 8-4-38 Chandēri.

Elsewhere noted: Bhōbāl: Mathār, Gwālior: Gwālior City and Fort Satanwāra, Dhār: Gūjri, Māndū.

[These specimens are intermediate in size and colour, but may be called *indica* under the arbitrary convention given in *J.B.N.H.S.*, xxxviii, 237.—H.W.]

Common. Ovary of 625 (8 April) granular.

Ninox scutulata lugubris (Tickell). The Indian Brown Hawk-Owl.

Specimen collected: Gwālior: 450 ♀ 9-3-38 Narwar Fort.

Elsewhere not noted.

Ægyptius monachus (Linn.). The Cinereous Vulture.

A solitary bird observed on a high bank among the ravines of the Chambal River near Dhōlpūr (Gwālior boundary) 17-8-39. Unconfirmed.

Sarcogyps calvus (Scopoli). The Black or Pondicherry Vulture.

Noted: Bhōpāl: Sānchi, Mathār, Gwālior: Kūno.

Common. Singly or twos and threes at carcasses.

Gyps fulvus fulvescens (Hume). The Indian Griffon Vulture.

Noted: Bhōpāl: Sānchi, Dōdi, Mathār. Gwālior: Kūno. Dhār: Māndū.

Near Māndū (Nälcha) are suitable cliffs said to be used by these vultures in winter for breeding.

Gyps indicus subsp? The Long-billed Vulture.

Noted: *Bhōpāl*: Mathār.

Common?

Pseudogyps bengalensis (Gmelin). The Indian White-backed Vulture.

Noted: *Bhōpāl*: Mathār; *Gwālior*: Kūno. *Dhār*: Māndū.

Common everywhere.

Neophron percnopterus ginginianus (Lath.). The Smaller White-backed Scavenger Vulture.

Noted: *Bhōpāl*: Sānchi, Dōdi, Mathār. *Gwālior*: Kūno, Satanwāra, Narwar Fort, Sūrwāya, Bhīnd.

Common all over Central India. 2 nests in main forks of large Banyan and Mango trees, 22 March, with birds brooding!

Falco subbuteo subsp.? The Hobby.

Noted: *Gwālior*: Kūno.

Falco chiquera chiquera Dauden. The Red-headed Merlin.

Specimens collected: *Gwālior*: 569 ♂, 570 ♀ 28-3-38 Badarwās.

Testes 5×3 mm.; ovaries granular. A pair. Stomachs contained 1 leg each with feathers and remains of *Prinia sylvatica*.

Falco tinnunculus tinnunculus (Linn.). The European Kestrel.

Specimens collected: *Bhōpāl*: 233 ♂ 31-1-38 Jaithāri. *Gwālior*: 402 ♂ 2-3-38 Satanwāra, 486 ♂ 15-3-38 Narwar Fort.

Elsewhere noted: *Gwālior*: Kūno, Sardarpūr.

First of the season 17 September. Not abundant; occasional singles.

Falco jugger Gray. The Laggār Falcon.

Noted: *Gwālior*: Badarwās, Bāgh.

Aquila rapax vindhiana Franklin. The Indian Tawny Eagle.

Specimens collected: *Bhōpāl*: 105 ♂ 16-1-38 Dōdi. *Gwālior*: 320 ♂ 20-2-38 Kūno, 442 ♂ 8-3-38 Narwar Fort.

Elsewhere noted: *Bhōpāl*: Sānchi, Mathār, Jaithāri. *Gwālior*: Kūno, Satanwāra, Bhīnd.

Common.

Hieraëtus fasciatus fasciatus (Vieillot). Bonelli's Eagle.

Noted: *Gwālior*: Ummaidgarh Falls (Pārvati River), Kūno, Chhipōn (near Gūna). *Dhār*: Māndū.

Nisaëtus cirrhatus cirrhatus (Gmelin). The Indian Crested Hawk-Eagle.

Specimens collected: *Gwālior*: 604 ♂ 2-4-38 Chhipōn (near Gūna).

Circaëtus ferox (Gmelin). The Short-toed Eagle.

Specimens collected: *Gwālior*: 255 ♂ 12-2-38 Kūno.

Testes 15×10 mm.

Haematornis cheela subsp.? The Crested Serpent-Eagle.

Noted: *Bhōpāl*: Mathār. *Gwālior*: Chandēri, *Indore*: Chōral.

Butastur teesa (Franklin). The White-eyed Buzzard-Eagle.

Specimens collected: *Bhōpāl*: 26 ♂ 8-1-38 Sānchi, 184 ♂ 24-1-38 Mathār.

Elsewhere noted: *Bhōpāl*: Jaithāri, Dōdi, *Gwālior*: Satanwāra, Narwar Fort, Sardarpūr. *Dhār*: Gūjri.

Not uncommon but sparingly. Occasional singles.

Haliaëtus leucoryphus Pallas. Pallas's Fishing Eagle.

Noted: *Gwālior*: Chambal River (*Gwālior-Dhōlpūr* boundary).

Haliaëtus Indus Indus (Bodd.). The Brahminy Kite.

Noted: Bhopāl Lake; *Indore*: Bijwār.

Uncommon.

Milvus migrans govinda Sykes. The Pariah Kite.

Noted : *Bhōpāl* : Bhōpāl City, Sānchi, Dōdi, Mathār. *Gwālior* : Gwālior City, Satanwāra, *Indore* : Indore City.

Common, especially in and about towns.

Elanus caeruleus vociferus (Latham). The Black-winged Kite.

Specimens collected : *Gwālior* : 467 ♀ 13-3-38 Narwar Fort, 490 ♀ 17-3-38 Sūrwāya.

Elsewhere noted : *Bhōpāl* : Mathār, Jaithāri. *Gwālior* : Kūno. Sparse.

Circus macrourus (S. G. Mmelin). The Pale Harrier.

Specimen collected : *Bhōpāl* : 43 ♀ 9-1-38 Sānchi.

Elsewhere noted : *Gwālior* : Narwar Fort, Satanwāra, Anjhēra *Dhār* : Māndu (or *pygargus*?).

First of season : 11 September.

Circus aeruginosus aeruginosus (Linn.). The Marsh Harrier.

Noted : *Bhōpāl* : Bhōpāl Lake; *Gwālior* : Satanwāra, Badarwās.

Astur badius dussumieri (Temm.). The Indian Shikra.

Specimens collected : *Gwālior* : 468 ♀ 13-3-38 Narwar Fort, 599 ♀ 2-4-38 Gūna, *Indore* : 758 ♂ imm. 31-8-38 Chōral.

Elsewhere noted : *Bhōpāl* : Sānchi, Mathār, Jaithāri.

Ovary of 468 (13 March) granular.

Crocosoma phoenicopterus chlorogaster (Blyth). The Southern Green Pigeon.

Specimens collected : *Bhōpāl* : 1 ♂ 7-1-38, 13 ♀ 8-1-38 Sānchi; 241 ♀ 1-2-38 Jaithāri; *Gwālior* : 541 ♂ 22-3-38 Sūrwāya.

Elsewhere noted : *Bhōpāl* : Mathār, *Gwālior* : Kūno, Narwar Fort. *Indore* : Chōral. *Dhār* : Māndu.

[No. 241 has the forehead washed with greenish and a band of greenish across the base of the tail, but it agrees with the rest of the series which lack these greenish markings, in having the yellow abdomen of typical *chlorogaster*. 2 ♂♂ wing 190-192; 2 ♀♀ 187-190 mm.—H.W.]

Common. Ovary of 241 (1 February) granular. Testes of 541 (22 March) 5×3 mm.

***Columba livia* subsp? The Blue Rock-Pigeon.**

Specimens collected : *Gwālior* : 298 ♀ 17-2-38, 316 ♀ 20-2-38 Kūno.

Elsewhere noted : *Gwālior* : Satanwāra, Narwar Fort, Sūrwāya, Bāgh, *Dhār* : Māndu.

[2 ♀♀ wings 220, 220 mm. Both have the rump concolorous with the back. In colour and size these birds match my series from the Punjab, but until material is available from Southern India to allow the characteristics of true *intermedia* to be satisfactorily appreciated I can neither define the ranges or differences of *intermedia* and *neglecta* nor identify individual birds with any satisfaction.—H.W.]

Ovaries of specimens mature. Largest follicle 5 mm.

Streptopelia orientalis meena Sykes. The Indian Rufous Turtle-Dove.

Specimen collected : *Gwālior* : 577 ♀ 29-3-38 Badarwās.

Elsewhere noted : *Bhōpāl* : Mathār, *Gwālior* : Chandēri.

[This is the form which breeds in the N.-W. Himalayas, *vide* my discussion of the names and races in *J.B.N.H.S.*, xxxviii, 678—H.W.]

Streptopelia chinensis suratensis (Gmelin). The Indian Spotted Dove.

Specimens collected : *Bhōpāl* : 174 ♀ 23-1-38, 183 ♂ 24-1-38 Mathār.

Elsewhere noted : *Bhōpāl* : Sānchi, Dōdi, Jaithāri. *Gwālior* : Kūno, Satanwāra, Narwar Fort, Sūrwāya, Badarwās, Gūna, Chandēri, Bāgh. *Indore* : Bījwār. *Dhār* : Gūjri, Māndu. Absent from Bhind.

Common. Facies preferences of the various doves more noticeable in dry season. Nest with c/2 on 19 September (Bāgh).

Streptopelia senegalensis cambayensis (Gmelin). The Indian Little Brown Dove.

No specimens.

Noted: *Bhōpāl*: Sānchi, Dōdi, Jaithāri. Absent at Mathār. *Gwālior*: Gwālior Fort and Environs, Kūno, Satanwāra, Narwar Fort, Sūrwāya, Badarwās, Gūna, Bhind, Indore: Bijwār. *Dhār*: Gūjri, Māndu. Bāgh.

Common.

Streptopelia decaocto decaocto (Frivaldszky). The Indian Ring Dove.

Specimens collected: *Bhōpāl*: 160 ♂ 22-1-38 Mathār. *Gwālior*: 296 ♂, 297 ♀ 17-2-35 Kūno.

Elsewhere noted: *Bhōpāl*: Sānchi, Dōdi, Jaithāri. *Gwālior*: Gwālior Fort and Environs, Satanwāra, Narwar Fort, Sūrwāya, Badarwās, Gūna, Bhind, Bāgh, Indore: Bijwār. *Dhār*: Gūjri, Māndu.

Common. Nests with c/2 and c/3 (!) respectively on 18 September (Bāgh).

Onopophelia tranquebarica tranquebarica (Hermann). The Indian Red Turtle-Dove.

Specimens collected: *Gwālior*: 387 ♂ 28-2-38 Satanwāra; 475 ♂ 14-3-38 Narwar.

Elsewhere noted: *Bhōpāl*: Dōdi, *Gwālior*: Sūrwāya, Badarwās, Bhind, Indore: Bijwār.

The least common dove. Testes of 387 (28 February) 12×5 mm.

Pterocles exustus ellioti Bogdanow. The Common Indian Sandgrouse.

Specimens collected: *Bhōpāl*: 78 ♂ 14-1-38 Dōdi. *Gwālior*: 270 ♂ 14-2-38 Kūno.

Elsewhere noted: *Gwālior*: Ummaidgarh Falls (Pārvati River); Satanwāra, Sūrwāya.

Not uncommon.

Pterocles indicus (Gmelin). The Painted Sandgrouse.

Specimens collected: *Bhōpāl*: 179 ♀ 24-1-38 Mathār. *Gwālior*: 278 ♂ 15-2-38, 313 ♀ 20-2-38 Kūno; 390 ♂, 391 ♀ 28-2-38, 398 ♂ 1-3-38 Satanwāra.

Elsewhere noted: *Gwālior*: Narwar Fort.

Not uncommon in dry forest. Gonads of January and February specimens enlarged, but not fully mature.

Pavo cristatus Linn. The Common Peafowl.

Noted: *Bhōpāl*: Sānchi, *Gwālior*: Kūno, Narwar Fort, Gwālior Fort and Environs, Bhind and elsewhere. *Indore*: Bijwār.

Protected by law in Gwālior and Indore, consequently very abundant and tame; commonly about villages.

Gallus sonneratii Temm. The Grey Jungle-fowl.

Strangely enough not met with or heard at all although the biotope seemed eminently suitable. I have only one doubtful sight record of a hen from Mānpur (Indore). It is said to occur in parts of Bhōpāl State and in the portion of Indore State lying in the Sātpuras south of the Nerbada River.

Galloperdix lunulata (Valenc.). The Painted Spur-Fowl.

Specimens collected: *Bhōpāl*: 7 ♀ 7-1-38 Sānchi; *Gwālior*: 456 ♀, 457 ♂ 10-3-38, 488 ♀ 15-3-38 Narwar Fort, 614 ♂, 615 ♂ 5-4-38 Bajranggarh (near Gūna), 622 ♀ 7-4-38, 632 ♀ 9-4-38, 638 ♂ 11-4-38 Chandēri.

Elsewhere noted: *Gwālior*: Kūno, Sūrwāya.

[Nos. 457, 614, 615, 638 are all adult males, with 2 large spurs on each leg and no sign of moult, yet I find considerable variation on the wings which does not seem to have been recorded. These vary from a bird like No. 457 which has so much metallic green on the wing coverts that the chestnut is only visible on the outer half of the wing coverts (*viewed en masse*) and even there a considerable part of the feathers are glossy green, to a bird like No. 614. In this the wing coverts are practically all chestnut with the metallic green confined to inconspicuous tips on many of the feathers. There is similar variation in the amount of metallic green on the scapulars and central back.]

both varieties the white spotting persists. I see no evidence that this variation has any connection with age.

The other 5 birds are all apparently adult females and the variation in their plumage is trifling, confined to the brightness of the head markings and the presence or absence of shadowy lunate marking on the tips of the breast feathers. The spurs are one on each leg (twice), 2 on one and 1 on the other, and 2 on each leg (twice). No specimen shows any trace of moult.

Narwar is the most north-westerly locality from which I have seen this species.

Measurements :	Bill	Wing	Tail
4 ♂♂	23-24·5	153-167	120-129 mm.
5 ♀♀	22-23	150-157	107-128 mm.

These are slightly larger than the specimens obtained in the other surveys.—H.W.]

Not uncommon. Frequentes stony *Anogeissus* covered hummocks and overgrown fort ruins. All the specimens of March and April had maturing gonads. Largest ovarian follicle of 632 (9 April) 4 mm. in diam.; testes of 638 (11 April) 10×6 mm.

Excalfactoria chinensis [chinensis (Linn.)]. The Blue-breasted Quail.

Not met with, but a bunch of feathers picked up in grass and teak forest at Manthār (Bhōpāl State) 22 January.

Coturnix coturnix coturnix (Linn.). The Common or Grey Quail.

Specimens collected : Bhōpāl : 147 ♂ 19-1-38 Dōdi; Gwālior : 349 ♂ 25-2-38 Satanwāra.

Elsewhere not noted.

Distinctly uncommon.

Coturnix coromandelica (Gmelin). The Black-breasted or Rain Quail.

No specimens.

Noted : Bhōpāl : Dōdi; Gwālior : All along motor road from Gwālior to Shivpūri in grassy country (August/September); Indore : Bijāsan Ramna near Indore City; Dhār : Grass fields near Jhira Palace (Dhār City).

Calling on every side during August/September.

Perdicula asiatica asiatica (Latham). The Jungle Bush-Quail.

Specimens collected : Bhōpāl : 27 ♀ juv. 8-1-38 Sānchi; 130 ♀, 131 ♀ pull, 14-1-38 Dōdi; 237 ♀ 1-2-38 Jaithāri. Gwālior : 314 ♂ 20-2-38 Kūno; 422 ♂, 423 ♀, 424 ♂, 425 ♀ 6-3-38, 431 ♂ 7-3-38 Narwar Fort; 878 ♂ 19-9-38 Bāgh; Dhār : 847 ♂ 11-9-38 Māndū. The birds from Northern Gwalior are not quite typical.

[The two species of Bush-Quail of the genus *Perdicula* have always given observers and writers trouble because of the superficial similarity between the plumages of the 2 species, because of the difficulty of understanding the plumage sequences without a good deal of material and that specially collected *ad hoc*, and finally because of the fact that the distributions of the two species largely coincide. It was also unfortunate that at an early stage in the recorded history of the 2 species the theory was propounded that the 2 species were found on different types of terrain, for this idea has been repeated again and again without careful verification and I believe that it will be found to be largely or entirely incorrect. A belief in it has, however, coloured most of the accounts of the species.

It remained for Mr. Stuart Baker in his review of this genus (*J.B.N.H.S.*, xxix, p. 310) to take a short-cut out of all these difficulties by propounding the superficially attractive theory that the 2 birds *asiatica* and *argoondah* were races of one species. This theory I examined at some length in the Eastern Ghats Survey review (*J.B.N.H.S.*, xxxviii, 685) and there I showed—at any rate to my own satisfaction—that the theory could not be accepted and that there were certainly two species, one of which at any rate had its own races. Attention having thus been attracted to the problem, I was fortunate in being able to assemble

further fresh material through the kindness and activity of Mr. H. W. Waite, Mr. E. A. D'Abreu and Col. R. Meinertzhagen, and now finally but very far from least, Mr. Sálim Ali. The result has been to clear up matters still further.

When writing the Eastern Ghats review I could not understand the plumages of the two species and so worked on a very conservative basis, not being sure whether the differences observed in the British Museum series were individual or racial or how far reliance could be placed on the sexing of the various specimens. The new material however, and particularly the fine series of both species collected in this survey, has given me a very good (though not yet quite complete) idea of the plumage sequences of the two forms and I am now able to add to the very cautious conclusions originally ventured upon.

In the first place *argoondah*, with its more limited distribution, can now be seen to have two races: *argoondah* and *meinertzhageni* (*Bull. B.O.C.*, cccevii, p. 9—type locality Nasirabad). In the second place it is clear that the three races of *asiatica* recognised in the Eastern Ghats Survey are not sufficient. This species, with its small size for a Galline bird and its habit of making exceedingly short flights even when disturbed, is sedentary beyond the average of its family and there is nothing surprising therefore in its having developed a number of races.

In the Eastern Ghats Survey I recognised three races of *asiatica*, namely the typical race, the red race *vidali* from South Konkan and *ceylonensis* from Ceylon, at the same time hinting that this might not be sufficient. Since then I have described the pale north-west race *punjaubi* (*Bull. B.O.C.* type locality Ambala). The present series has helped to emphasize what was not clear before—or at least which I did not dare recognise until the plumages were more clearly understood—that the typical race is a dark blackish-looking bird, most clearly differentiated on the one hand from the red bird found below the Ghats in the South Konkan, and from the grey or sandy coloured bird found in other parts of India. These birds I have now separated as *punjaubi* but suspect that new material when it is forthcoming will show that South Indian birds again require separation both on size and colour. In the meantime it may be helpful to sketch roughly the plumages of this species:—

The chick is thus described by Ticehurst (*J.B.N.H.S.*, xxxi, p. 376) from a specimen of *P.a. punjaubi* collected by me in the Kangra District:

From base of bill over crown, down centre of back to tail, a broad chestnut band edged on each side with dark brown; outside this from base of bill a broad ochraceous supra-orbital stripe reaching nape and surmounting a narrow dark brown superciliary stripe; ear coverts and short moustachial streak dark brown. Rest of upper parts dappled rusty brown and light: underparts ochraceous-grey.

The juvenile plumage (sexes alike and described from a pair of *P.a. punjaubi* collected by me in Kangra District) is as follows:—A broad band down the centre of the crown brown edged with blackish-brown; a broad fulvous-white supercilium from the lores to the posterior edge of the ear coverts; cheeks and ear coverts dark brown with whitish shaft streaks; upper plumage warm sandy brown, the feathers of the hindneck, upper back and wing-coverts with conspicuous fulvous shaft streaks and broken blackish bars, the shaft streaks becoming broader on the scapulars and the bars becoming black patches on their inner webs; primaries dark brown mottled and streaked with sandy fulvous; secondaries, tertaries and tail warm sandy brown with fulvous shafts and mottled, speckled and barred with fulvous and blackish-brown; lower plumage vinous-huff, the chin, throat and breast with shining white shaft streaks.

This juvenile plumage seems to be moulted rather gradually during the first winter giving place to the respective adult male and female plumages. As in other game birds the outer two or three juvenile primaries, more pointed in character than those which will succeed them, are apparently retained to the first post nuptial moult, but they are not always easy to recognise.

No. 27 in this series is a juvenile in the plumage described above but is throughout in a far darker, blackish-brown key, following and emphasising the sub-specific difference between the typical race and *punjaubi*.

The adult male and female are easy to recognise and are as usually described. The adult male has black and white barred underparts with a chestnut chin and throat. The female has vinous-brown underparts with a chest-

nut chin and throat. It must, however, be realised that some adult females have an adumbration of black and white barring on the lower throat and breast which must not be confused with the truly barred black and white feathers which will be found irregularly on juvenile males which have moulted some of their juvenile feathers.—H.W.]

Common. No. 27 (8 January) and 131 (18 January) were juvenile and pullet respectively. The birds were mostly paired off in August September. Testes of 847 (11 September) 11×6 mm.; of 878 (19 September) 11×7 mm. On 19 September a pair was observed accompanied by half-grown pullets.

Perdicula argoondah argoondah (Sykes). The Rock Bush-Quail.

Specimens collected: *Indore*: 733 ♀, 734 ♂ 29-8-38 Bijwār.

Perdicula argoondah meinertzhageni Whistler.

Specimens collected: *Gwālior*: 392 ♀ 28-2-38 Satānwāra; 574 ♂, 575 ♂, 576 ♀ 29-3-38 Badarwās; 660 ♀ 17-4-38, 670 ♀, 671 ♂ 18-4-38 Bhīnd.

[The two birds from Indore State are very dark and agree beyond doubt with the typical race. The Gwālior series is not so uniform and four specimens (Nos. 392, 574, 660, 670) being in transition from juvenile to adult plumage, is not so easy to recognise. It is, however, certainly closer to *meinertzhageni*.]

The adult plumage of this species is of course easily recognised from the corresponding adult plumages of *asiatica*. In the male the most marked characteristic is the dull brick-red chin and throat patch as distinct from chestnut. The female lacks the throat-patch altogether (in *asiatica* it is as distinct in the female as in the male) having the chin whitish and the throat concolorous with the rest of the lower plumage. The presence or absence of marking on the brown inner webs of the primaries is often cited as a distinguishing feature between the two species. It is correct that in *asiatica* the inner web is unmarked and this web is certainly as a rule barred or mottled or 'watered' with fulvous in *argoondah*, but it must be remembered that in some specimens the inner web is unmarked as in *asiatica*. These remarks only apply to the adult primaries. In both species the juvenile primaries are normally marked on the inner web. This character therefore must be used with great caution.

The chick of *argoondah* is as yet undescribed and I have seen no specimen of it.

The juvenile plumage may be thus described from a female in my collection of the race *meinertzhageni* from Nasirabad, the type locality: Crown and nape brown, barred with black, the feathers of the forecrown with pale shafts; supercilium extending beyond ear coverts pale creamy-fulvous; ear coverts and cheeks mixed buffy-brown and dark brown; remainder of upper plumage earthy-brown, the feathers speckled and broadly barred with black, and with fulvous shaft streaks, these markings becoming obsolescent on the rump and upper tail coverts, primaries, secondaries, tertaries and tail warm sandy brown, barred and freckled on both webs with brownish-black, the tertaries with broad fulvous shaft stripes and black blotches on the inner webs; chin vinous buff; remainder of lower plumage fulvous-buff, the throat, breast and to a less extent the flanks barred with blackish-brown, the feathers with white shafts.

It will be noticed that this juvenile plumage differs from that of *asiatica* in one most marked detail, that instead of being roughly unicolorous below with shining white shaft streaks, the throat and breast are barred with blackish, thereby superficially resembling the adult male. This explains why in this species one meets numbers of immature females which seem to have a mixture of male and female plumage below. The warm vinous-buff of the adult female underparts is, in these birds, mixed with barred black and white feathers which are remains of the juvenile plumage. Whereas on the other hand in *asiatica* the birds with mixed vinous-buff and black and white barred plumage are young males exchanging the vinous-buff juvenile plumage for the adult black and white bars. In the one case the black and white bars are juvenile feathers, in the other case adult feathers. The distinction is interesting and important, and essential to an understanding of the two species.—H.W.]

Common. Gonads developed between April and September.

Francolinus pictus (Jardine & Selby). The Painted Partridge.

Specimens collected. *Bhōpāl*: 77 ♀ 14-1-38, 142 ♀ 19-1-38 Dōdi; 212 ♂ 26-1-38 Mathār. *Gwālior*: 526 ♂ 21-3-38. Sūrwāya; *Dhār*: 850 ♂, 851 ♂ 12-9-38 Māndū.

Elsewhere noted: *Bhōpāl*: City Environs, Jaithāri. *Gwālior*: Kūno, Badarwās, Gūna, Rūthīai, Chandēri, Deharda-Isāgarh Road. *Indore*: Bijāsan Ramna (Indore City Environs), Bijwār, Mhow (around Bircha Lake).

[I cannot yet fully satisfy myself that there are two races of this species; nor can I obtain the necessary material to make out the plumages. The sexes can certainly not always be distinguished by plumage.—H.W.]

Common but not abundant. Breeding in September. Testes of 850 and 851 (12 Sept.) 19×12 and 17×11 mm. respectively. Local shikari asserted that male and female call alike.

Francolinus pondicerianus interpositus Hartert. The Northern Grey Partridge.

Specimens collected: *Bhōpāl*: 232 ♂ 31-1-38 Jaithāri. *Gwālior*: 317 ♀ 20-2-38 Kūno.

Elsewhere noted: *Bhōpāl*: Sānchi, Bhōpāl Lake Environs. *Gwālior*: Sūrwāya, Badarwās, Rūthīai, Barai (near Bhind), Gūna, Chandēri.

Common, but numbers much reduced in certain areas owing to excessive netting.

Breeding in March/April. Two broods of 2 or 3-day old chicks with parents on 19 April (Barai *Dalbergia* Plantation). One brood tended by 3 adults!

Turnix suscitator taijor (Sykes). The Common Bustard Quail.

Specimens collected: *Bhōpāl*: 22 ♀ 8-1-38 Sānchi, 79 ♀ 14-1-38 Dōdi. *Gwālior*: 528 ♀, 529 ♀ 21-3-38 Sūrwāya.

Elsewhere noted: *Gwālior*: Kūno, Badarwās, Chandēri Fort. *Indore*: Bijwār. *Dhār*: Māndū.

Not uncommon. Ovaries of specimens 21 March granular.

Turnix duccumieri (Temm.) The Little Button-Quail.

Specimen collected: *Gwālior*: 294 ♂ 17-2-38 Kūno.

Elsewhere not noted.

Apparently not common.

Hypotaenidia striata gularis (Horsf.). The Indian Blue-breasted Banded Rail.

No specimens.

Noted: *Bhōpāl*: Bhōpāl Lake; *Gwālior*: Satanwāra (This species or *Rallus aquaticus*?).

Amaurornis phoenicurus chinensis (Bodd.). The Indian White-breasted Waterhen.

No specimens.

Noted: *Bhōpāl*: Sānchi, Bhōpāl Lake, Jaithāri (on Tendōni River); *Indore*: Bijwār.

Gallinula chloropus indicus Blyth. The Indian Moorhen.

No specimens.

Noted: *Gwālior*: Shivpūri, Narwar (Sind River), Chandēri.

Fulica atra atra Linnaeus. The Coot.

No specimens.

Noted: *Bhōpāl*: Bhōpāl Lake; *Gwālior*: Satanwāra.

Metopidius indicus (Latham). The Bronze-winged Jacana.

Specimen collected: *Bhōpāl*: 2 ♀ 7-1-38 Sānchi.

Elsewhere noted: *Gwālior*: Satanwāra, Chandēri, Panchamnagar, Rāmnagar Tank. *Bhōpāl*: Bhōpāl Lake.

Hydrophasianus chirurgus (Scopoli). The Pheasant-tailed Jacana.

Specimen collected: *Indore*: 792 ♂ juv. 5-9-38 Mandleshwar (Chōli Tank).

Noted: *Bhōpāl*: Bhōpāl Lake, *Gwālior*: Satanwāra, Chandēri, Rāmnagar Tank (near Gūna), *Indore*: Chōral (Balwāda Tank), *Dhār*: Māndu.

[The specimen is a juvenile with little of the down plumage remaining. It may be described as follows:

Forehead, crown and nape chestnut; hindneck still in down, warm buff with greyish bases and bounded by a shadowy blackish line from the ear-coverts to the shoulders; upper and lower back and the scapulars dark brown, the feathers broadly bordered with deep rusty fulvous; rump and upper tail coverts dark brown, the feathers broadly tipped with deep rusty fulvous, this colour divided by a dark brown bar in some feathers; wing coverts dove brown, barred with darker brown and washed with fulvous, a broad white band down the edge of the wing; primaries and secondaries short and in quill, but it is possible to see that they will be as in the adult though the filaments at the tips of the first three primaries are not so fully developed; tail not yet visible; whole lower plumage white, the earcoverts, sides of the throat and the breast faintly washed with salmon pink, the breast dully spotted with sooty-black. The carpal spur of the wing is already evident.—H.W.]

Common. Several juveniles on 5 September and a c/z resting directly upon floating singāra (*Trapa bispinosa*) leaves (Chōli Tank, Mandleshwar, Indore).

Rostratula benghalensis benghalensis (Linn.). The Painted Snipe.

Specimen collected: *Gwālior*: 376 ♀ 27-2-38 Satanwāra.

Elsewhere noted: *Gwālior*: Chandēri.

Antigone antigone antigone (Linnaeus). The Sarus Crane.

No specimens.

Noted: *Bhōpāl*: Bhōpāl Lake, Sānchi (Gūlgāon Tank), *Gwālior*: Harsī Lake (Narwar Dist.), Sūrwāya, Chandēri; *Indore*: Chōral (Balwāda Tank), Mandleshwar (Chōli Tank); *Dhār*: Māndu.

Common. Usually in pairs accompanied by sub-adult young—1 or 2—with out red head. Nest in shallow reed-covered tank with c/z on 11 September (Māndu).

Choriotes nigriceps (Vigors). The Great Indian Bustard.

No specimens.

Noted: *Gwālior*: Esāgarh.

Now said to be becoming increasingly rare in Gwālior territory and to be met with sparingly and rather sporadically in the following localities: Near Mohana; along Deharda-Esāgarh road in various spots; along Pāchchār-Esāgarh road near Sāruskhēri; west of Gwālior City near Tighāra Lake and Pagāra; near Jāura in Morena District; along portions of Shīvpūri-Pōhri road. Greatly persecuted by shikaris and needs stringent protection.

Sypheotides indica (Miller). The Lesser Florican or Likh.

Specimens collected: *Indore*: 684 ♂ 21-8-38 Indore environs (Bijāsan Ramna); *Gwālior*: 871 ♂, 872 ♂ 17-9-38 Sardārpur (on Jhabua road, ca 4 m. from Rajgarh village).

The testes of the specimens—all in breeding plumage—measured 14×8, 12×5 and 8×4 respectively. They were busy leaping up into the air from time to time in nuptial display, and evidently preparing to breed.

Burhinus oedicnemus indicus (Salvadori). The Indian Stone-Plover.

Specimens collected: *Bhōpāl*: 8 ♀ 7-1-38, 49 ♂ 10-1-38 Sānchi, *Gwālior*: 565 ♂ 27-3-38 Badarwās.

Elsewhere noted: *Bhōpāl*: Dōdi, *Gwālior*: Kūno, Sūrwāya, Sardāpūr, Bāgh. *Dhār*: Gūjri.

Common. Often in flocks of 6 to 8. Vociferous during moonlit nights.

Esacus recurvirostris (Cuvier). The Great Stone-Plover.

Specimens collected: *Gwālior*: 329 ♂ 20-2-38 Kūno; 545 ♂ 25-3-38 Badarwās.

Elsewhere noted: *Gwālior*: Satanwāra, Narwar (Sind River), Chandēri (Betwa River).

Pairs on shingle banks and rocky beds of rivers. Testes of specimens 8×5 and 10×5 respectively.

Cursorius coromandelicus coromandelicus (Gmelin). The Indian Courser.

Specimens collected: *Gwālior*: 356 ♂, 357 ♀ 25-2-38 Satanwāra.

Elsewhere noted: *Gwālior*: Sūrwāya.

Not common. Gonads of specimens: ♂ 5×4 mm.; ♀ largest ovum 1 mm.

Gelochelidon nilotica nilotica (Gmelin). The Gull-billed Tern.

A single tern with black bill observed at Narwar (Sind River) on 14 March, flying steadily at great height due North, was evidently this species.

Sterna aurantia Gray. The Indian River Tern.

Specimen collected: *Gwālior*: 338 ♂ 24-2-38 Satanwāra.

Elsewhere noted: *Gwālior*: Gūna (Rāmpūra Tank), Chandēri.

Testes 7×5 mm.

Sterna melanogaster Temminck. The Black-bellied Tern.

Specimen collected: *Gwālior*: 612 ♀ 4-4-38 Gūna (Rāmpūra Tank).

Elsewhere noted: *Bhōpāl*: Dōdi.

Ovary granular.

Charadrius dubius curonicus Gmelin. The European Little Ringed Plover.

Specimen collected: *Bhōpāl*: 84 ♀ 14-1-38 Dōdi.

[This bird is still in immature plumage, but its measurements (bill from skull 17, wing 120.5, tail 63, tarsus 23 mm.) prevent me attributing it to anything but this race which is no doubt a winter visitor.—H.W.]

Charadrius dubius jerdoni (Legge). Jerdon's Little Ringed Plover.

Specimens collected: *Gwālior*: 327 ♀, 328 ♂ 20-2-38 Kūno, 413 ♂ 3-3-38 Satanwāra, 584 ♀, 585 ♂, 586 ♂ 1-4-38 Rūthiai; *Dhar*: 819 1 7-9-38 Gūjri. Elsewhere noted: *Gwālior*: Harsi Lake, Shīvpūri.

[No. 819 is in juvenile plumage. The remainder are adults and from the state of their organs as recorded on the labels were doubtless on their breeding ground.

The series measures: Bill from skull wing tail tarsus
 $4\delta\delta$ 15.5-16.5 111.5-115 59-62 24-24.5 mm.
 $2\varphi\varphi$ 15.5-16.5 114-117 62.5-63.5 24-25 mm.

They evidently belong to the resident race which is commonly known as *Ch.d.jerdoni* though as I pointed out in the Eastern Ghats Survey, there are no specimens from Ceylon available to establish what that race is actually like and whether it is the same as Indian birds.—H.W.]

Gonads of specimens between 20 February and 1 April maturing. Testes averaging 5×3 mm.; ovaries granular.

Lobivanellus indicus indicus (Boddaert). The Indian Red-wattled Lapwing.

Specimen collected: *Bhōpāl*: 221 ♀ 30-1-38 Jaithāri.

Elsewhere noted: *Bhōpāl*: Bhōpāl Lake, Sānchi. *Gwālior*: Kūno, Satanwāra, Shīvpūri, Indore: Bījwār.

Common. In the rainy season commonly seen along the grassy edges of motor roads.

Lobipluvia malabarica (Boddaert). The Yellow-wattled Lapwing.

Specimens collected: *Bhōpāl*: 42 ♀ 9-1-38 Sānchi, 128 ♂ 18-1-38 Dōdi. *Gwālior*: 362 ♀ 26-2-38 Satanwāra.

Elsewhere noted: *Gwālior*: Kūno, Gūna, Rūthiai. *Indore*: Indore town outskirts. *Dhar*: Gūjri.

Not uncommon. Largest ovarian follicle of 362 (26 February) 3 mm.

Himantopus himantopus himantopus (Linn.). The Black-winged Stilt.

No specimens.

Noted: *Bhōpāl*: Dōdi; *Gwālior*: Satanwāra, Sūrwāya.

On village and irrigation tanks.

Tringa ochropus (Linnaeus). The Green Sandpiper.

Specimen collected: *Bhōpāl*: 60 ♀ 10-1-38 Sānchi.

Elsewhere noted: *Bhōpāl*: Bhōpāl Lake outskirts; Dōdi; *Gwalior*: Satanwāra, Narwar Fort, Sūrwāya, Badarwās, Chandēri; *Indore*: Bijwār, Chōral; *Dhār*: Gūjri.

Common in winter. Earliest date 26 August, latest 8 April.

Tringa stagnatilis (Bechstein). The Marsh Sandpiper.

No specimens.

Noted: *Bhōpāl*: Bhōpāl Lake; *Gwalior*: Satanwāra, Chandēri, Bhind.

Latest date 20 April.

Tringa glareola Linnaeus. The Wood Sandpiper.

Specimen collected: *Gwālior*: 503 ♂ 18-3-38 Sūrwāya.

Elsewhere noted: *Gwālior*: Chandēri.

Latest date 8 April.

Tringa hypoleucus Linnaeus. The Common Sandpiper.

Specimen collected: *Dhār*: 775 ♂ 3-9-38 Gūjri.

Noted: *Bhopāl*: Sānchi, Dōdi, Bhōpāl; *Gwālior*: Satanwāra, Narwar Fort, Sūrwāya, Chandēri, Bhind.

Common. Last date 19 April.

Tringa erythropus (Vroeg). The Spotted or Dusky Redshank.

Specimen collected: *Bhopāl*: 85 ♀ 14-1-38 Dōdi.

Elsewhere noted (this or *totanus*?): *Gwālior*: Satanwāra, Sūrwāya.

Glottis nebularia (Gunnerus). The Greenshank.

Specimen collected: *Bhōpāl*: 29 ♀ 9-1-38 Sānchi.

Elsewhere noted: *Bhōpāl*: Dōdi; *Gwālior*: Kūno, Satanwāra, Narwar (Sind River), Sūrwāya, Rūthīai, Chandēri, Bhind; *Dhār*: Gūjri.
Earliest date 3 September; latest 19 April.

Erolia temminckii (Leisler). Temminck's Stint.

Specimens collected: *Gwālior*: 339 ♀ 24-2-38, 352 ♂ 25-2-38 Satanwāra.

Elsewhere noted: *Bhōpāl*: Dōdi; *Gwālior*: Harsī Lake.

Small flocks.

Capella gallinago gallinago (Linn.). The Common or Fantail Snipe.

Specimen collected: *Gwālior*: 378 ♀ 27-2-38 Satanwāra.

Elsewhere noted: *Gwālior*: Sūrwāya, Chandēri.

Latest date 8 April.

Capella stenura (Bonaparte). The Pintailed Snipe.

No specimens.

Noted: *Gwālior*: Satanwāra.

Lymnocryptes minimus (Brünnich). The Jack Snipe.

Specimen collected: *Gwālior*: 377 ♀ 27-2-38 Satanwāra.

Phalacrocorax carbo sinensis (Shaw). The Indian Large Cormorant.

No specimens.

Noted: *Gwālior*: Ummaidgarh Falls, Pārvati River.

Phalacrocorax niger (Vieillot). The Little Cormorant.

No specimens.

Noted: *Bhōpāl*: Sānchi, Dōdi, Bhōpāl Lake; *Gwālior*: Satanwāra, Narwar, Chandēri.

Anhinga melanogaster Pennant.

Specimen collected: *Gwālior*: 449 ♀ 9-3-38 Narwar Fort (Kātōra Tāl).

Elsewhere noted: *Bhōpāl*: Sānchi, Jāithāri; *Gwālior*: Ummaidgarh Falls (Pārvati R.)

Indore: Mandlēshwar.

[The innermost tertiary and the tail-feathers show the stiff corrugations which are such a marked feature of this species and which presumably have some connection with its wonderful diving powers.—H.W.]

Nesting in company with *Ardea purpurea* and *Ardeola grayii* on Babūl in Sāngī Tank near Mandleshwar. Several nearly full-fledged young on 5 September.

Platalea leucorodia Linnaeus. The Spoonbill.

No specimens.

Noted: *Bhōpāl*: Sānchi (Gūlgāon Tank); *Gwālior*: Satanwāra, Sūrwāya. Small flocks.

Threskiornis melanocephala (Latham). The White Ibis.

No specimens.

Noted: *Bhōpāl*: Sānchi; *Gwālior*: Satanwāra, Sūrwāya, Chandēri. Small parties.

Pseudibis papillosa (Temm. and Lang). The Indian Black Ibis.

No specimens.

Noted: *Bhōpāl*: Sānchi; *Gwālior*: Kūno, Satanwāra, Narwar, Chandēri, Bhind.

Pairs or small parties.

Ciconia ciconia subsp.? The White Stork.

No specimens.

Noted: *Gwālior*: Chandēri (3 or 4 on a tank, 8-4-38). The only meeting in Central India.

Dissoura episcopus episcopus (Bodd.). The White-necked Stork.

No specimens.

Noted: *Gwālior*: Kūno, Harsi Lake, Rūthiāi.

Large stick nest on top of bare *Bombax malabaricum* ca 40 ft. up, on river bank at Rūthiāi 1-4-38. 1 bird brooding, the other perched on rim.

Xenorhynchus asiaticus asiaticus (Latham). The Black-necked Stork.

No specimens.

Noted: *Gwālior*: Kūno, Harsi Lake, Sūrwāya, Chandēri, Esāgarh. Singly or pairs.

Ibis leucocephalus (Pennant). The Painted Stork.

No specimens.

Noted: *Bhōpāl*: Bhōpāl Lake; *Gwālior*: Kūno, Satanwāra, Harsi Lake, Narwar (Sind River). Small parties.

Anastomus oscitans (Bodd.). The Open-billed Stork.

No specimens.

Noted: *Gwālior*: Kūno, Satanwāra, Chandēri.

Singly or in small parties. Uncommon and excessively shy.

Ardea purpurea manillensis Meyen. The Eastern Purple Heron.

No specimens.

Noted: *Bhōpāl*: Sānchi, *Gwālior*: Satanwāra, Rāmpūra Tank (near Gūna), Chandēri; *Indore*: Mandleshwar.

Nesting in company with *Anhinga* and *Ardeola* on Babūl in Sāngī Tank near Mandleshwar, 5 September; several nearly full-fledged young awkwardly clambering about the branches.

Ardea cinerea (recirostris) Gould. The Eastern Grey Heron.

No specimens.

Noted: *Gwālior*: Kūno, Satanwāra, Narwar, Rāmpūra Tank (near Gūna), Bhind.

Solitaries.

Egretta alba subsp.? The Large Egret.

No specimens.

Noted: *Bhōpāl*: Dōdi; *Gwālior*: Satanwāra.

Solitaries.

Egretta intermedia intermedia (Wagler). The Indian Smaller Egret.

No specimens.

Noted: *Bhōpāl*: Sānchi, Bhōpāl Lake; *Gwālior*: Ummaidgarh Falls (Pārvati River), Narwar, Chandēri.

Egretta garzetta garzetta (Linn.). The Little Egret.

No specimens.

Noted: *Bhōpāl*: Bhōpāl Lake; *Gwālior*: Narwar (Sind River), Chandēri.

Bubulcus ibiscoromandus (Boddaert). The Cattle Egret.

No specimens.

Noted: *Gwālior*: Narwar, Sardārpūr; *Indore*: Mānpūr; *Dhār*: Gūjri, Māndu.

Butorides striatus javanicus (Horsfield). The Indian Little Green Heron.

Specimen collected: *Bhōpāl*: 136 ♀ 19-1-38 Dōdi.

Elsewhere noted: *Bhōpāl*: Jaithāri (Tendōni River); *Gwālior*: Bajranggarh (near Gūna).

Ardeola grayii (Sykes). The Indian Pond Heron.

Specimen collected: *Gwālior*: 465 ♂ 12-3-38 Narwar Fort (Katōra Tāl).

Elsewhere noted: *Bhōpāl*: Bhōpāl Lake; *Gwālior*: Satanwāra, Chandēri; *Indore*: Mandlēshwar.

Common. Nesting in company with *Anhinga* and *Ardea purpurea* in Babūl in Sāngi Tank near Mandlēshwar, 5 September.

Phoenicopterus ruber roseus Pallas. The Flamingo.

No specimens.

Noted: *Indore*: Mandlēshwar (Chōli Tank).

4 birds flying high overhead, 5 September.

Sarkidiornis melanotos Pennant. The Nukhta or Comb-Duck.

Specimens collected: *Gwālior*: 491 ♂, 492 ♀ 17-3-38 Sūrwāya, 535 ♀ 22-3-38.

Elsewhere noted: *Bhōpāl*: Sānchi (Gūlgāon Tank); *Gwālior*: Chandēri (Panchamnagar).

[No. 535 is an immature bird differing from the adult female in having less gloss on the black parts of the upper plumage; in having the white of the hindneck sullied with brown and barred with sooty-brown and black; the lower back and rump are dull greyish-white, the feathers edged with brownish and the upper tail coverts and tail are brown without gloss.—H.W.]

The ovary of 535, however was conspicuously granular suggesting that the bird was going to breed shortly.

Fairly common. Small parties and flocks up to 25.

Nettopus coromandelianus coromandelianus (Gmelin). The Cotton Teal.

Specimens collected: *Dhār*: 827 ♀, 828 ♂ 9-9-38 Māndu.

Elsewhere noted: *Bhōpāl*: Sānchi (Gūlgāon Tank); *Gwālior*: Chandēri, Esāgarh; *Indore*: Chōral (Balwāda Tank), Chōli Tank (near Mandlēshwar).

Fairly common in small numbers. Specimens a breeding pair. Testes of ♂ 29×18 mm.; soft-shelled oviduct egg in ♀ measuring 40×29 mm.

Anser indicus (Latham). The Bar-headed Goose.

No specimens.

Noted: *Gwālior*: Along Shīvpūri-Pohri road, 8 miles from the former. A flock of about 50 on a tank, 11 February.

Dendrocygna javanica (Horsf.). The Lesser or Common Whistling Teal.

No specimens.

Noted: *Gwālior*: Chandēri; *Dhār*: Māndū.

Small flocks up to end of April. A pair on 9 Sept.—evidently breeding.

Casarca ferruginea (Vroeg). The Ruddy Sheldrake.

No specimens.

Noted: *Gwālior*: Kūno, Satanwāra, Harsi Lake, Chandēri, Bhind.

Usually pairs. Once a flock of about 30. Latest date 19 April.

Mareca penelope (Linn.). The Wigeon.

No specimens.

Noted: *Gwālior*: Satanwāra, Chandēri (near Panchamnagar).

Nettion crecca crecca (Linn.). The Common Teal.

No specimens.

Noted: *Bhōpāl*: Bhōpāl Lake, Dōdi; *Gwālior*: Kūno, Satanwāra.

Small parties on tanks.

Dafila acuta (Linn.). The Pintail.

No specimens.

Noted: *Gwālior*: Chandēri.

Several on tank.

Spatula clypeata (Linn.). The Shoveller.

No specimens.

Noted: *Gwālior*: Satanwāra.

Nyroca ferina ferina (Linn.). The Pochard or Dun Bird.

No specimens.

Noted: *Gwālior*: Satanwāra.

Nyroca rufa rufa (Linn.). The White-eyed Pochard.

No specimens.

Noted: *Bhōpāl*: Bhōpāl Lake; *Gwālior*: Satanwāra.

The majority of duck on Bhōpāl Lake (2 February) were of this species.

Nyroca fuligula fuligula (Linn.). The Tufted Pochard.

No specimens.

Noted: *Bhōpāl*: Bhōpāl Lake; *Gwālior*: Satanwāra.

Podiceps ruficollis capensis Salvadori. The Indian Little Grebe.

Specimens collected: *Gwālior*: 497 ♀ 17-3-38 Sūrvāya, 530 ♀ 21-3-38.

Elsewhere noted: *Bhōpāl*: Bhōpāl Lake; *Gwālior*: Satanwāra; *Dhār*: Māndū. Fairly common. Ovaries of both specimens granular.

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(THE END)

A VISIT TO THE LACCADIVE ISLANDS.

BY

LIEUT.-COLONEL R. W. BURTON.

(*With four plates*).

In the minds of most people there will be some sort of romantic idea regarding coral islands. Blue lagoons, feathery palms, coral reefs, dusky beauties; all of these, with some reservation as to the latter, are to be found at Chetlat, a typical coral 'atoll' and the most northerly of the inhabited islands of the Laccadive archipelago.

It was at dawn on Friday, the 8th November 1935, that the writer crossed the bar of the Mangalore harbour in the 'Valia Bukkari' an *odam*, as the island coast-going vessels are termed, of 21 tons burthen. In length 37 feet with a draught of 5 feet 7 inches and a crew of 11 men there is in the whole of her construction not a single nail or bolt! The timbers are of the various trees which grow on the island, while the sweeps, used when becalmed, or to aid the rudder when going to another tack, are of coconut-palm wood. All the planks are secured by good joinery made fast by lashings of coir passed through holes bored to take them; even the rudder swings on hinges of coir rope. All the cordage is of island manufacture, and the rudely fashioned pulley blocks are made by the island carpenters. The mainmast is of teak from Indian forests, and the sixty-foot spar which carries the huge lateen sail is of mainland growth.

With a fair breeze from the land the mountains of the Western Ghats were out of sight by noon and we settled down to a voyage of uncertain duration. With luck we might do the 150 miles in three days or less, but with adverse winds or weather it might take thirteen. Such was the fate of one of these boats a year or so ago: thirteen days at sea to be driven ashore a hundred miles down the coast dismasted, rudderless, and all aboard in desperate straits for water. In view of such a happening we carried 40 gallons for our party of four, while the crew had their supply in a large earthenware vessel encased in coir-rope netting and slung below the leaf-thatched platform placed amidships as living and sleeping quarters for the crew. There also, on a floor of mud, is the cooking galley.

'Cabin accommodation' on the boat was a space beneath the poop nine feet wide and long narrowing to three feet at the stern-post, and two feet six inches high. When the vessel felt the first heave of the ocean the smell of the bilge water was so nauseating that I passed the whole voyage lying in the open on the rice cargo. Later on the horrible liquid, which instantly called up thoughts of diphtheria, was mostly baled out, but much of the

odour remained. Fortunate is R. B. in being wholly immune from sea sickness, yet a few minutes of that variety of eau-de-cologne would have given him the same green and yellow complexion as the poor R. A. (Mr. Ramaswamy Ayyangar, Research Assistant of the Madras Fisheries Department) who lay prostrate in the rabbit hutch to the last moment of the voyage.

It was interesting to observe the life of the Islanders, Muhammadans all, at such close quarters, and the interest was fully reciprocated! The two cooks, Melacheries by class, the lowest of the four social grades on the islands, prepared curry and rice for all, those on duty having their piled-up portion taken to them on large enamel-iron plates.

During the latter half of the 18th century such craft as this were used on occasion for the movement of troops of the East India Company from port to port along the Malabar Coast; and to this day, as I found on seeing the ship's manifest, it is entered that this small boat can carry 69 natives or 51 Europeans. Such trials did those gallant souls endure who laid the foundations of our Empire in the East.

The Tindal, as the Captain is styled, possessed a sextant in use of which he was wholly ignorant. The course was kept by compass aided by the position of the sun and stars. In the small hours of Sunday morning the sea was rather rough and a rope parted at the masthead. Being roused by the shouts of the Tindal the crew were quickly at their appointed stations and in a few seconds one of the men walked up the mast carrying a rope in his teeth which he rove through the block indifferent to the swaying of the vessel. Soon after dawn another of the crew, very Simian in profile, walked up in the same effortless way and announced 'some country is in sight.' This, after some questioning by the Tindal as to its shape, was announced to be Chetlat. Quite a good shot to hit a one mile bull's-eye at a range of a hundred and fifty! Before long the smudge became a line of verdure seemingly floating in the ocean, then the white line of surf could be seen, and the waving plumes of the palms, and by ten o'clock we were anchored outside the entrance to the lagoon having been afforded some excitement during the last few miles by a school of porpoises. The harpoon carried by every Island boat of whatever size had been immediately ready in the bows, but no opportunity came for a successful shot.

A square of white cloth flown on coming to anchor brought a boat from the lagoon, and in a short time we and all our belongings were aboard the 'Chetlat', being skilfully rowed in true sailor fashion through the lagoon entrance and over the transparent waters of the shallow lagoon to the sound of a far-echoing chanty on the part of the crew of twelve lusty rowers. A number of the inhabitants, headed by the Monegar, were assembled on the sandy shore to greet us, and I was quickly installed in the Cutcherry; R. A. being accommodated in another building close to it. We were fortunate in finding Mr. A. M. Khan at Chetlat on Inspection Duty from his Head Quarters at the island of Ameni thirty miles to the south-east, for at his hands was received much assistance



Chetlat : The tomb of Carpenter Primrose



Chetlat : Hauling in the *Ola Vala*.

in many ways and a semi-official introduction to the elders of the community.

The 'Chetlat' is a very substantial and well-built boat constructed by the inhabitants of the Island and presented by them to the Government in 1934 for the use of the Monegar for inter-island communication. It is consewn—not a nail in it—and rowed by twelve men.

In the afternoon a visit was made to the tomb of Carpenter Primrose of the 'Vizier' against the eastern shore. This merchant ship, laden with cotton goods and cutlery, was wrecked on the Cheriapani Reef, sixty miles to the north-west, in June 1853. The crew found their way to Chetlat where they stayed until conveyed to the mainland, and it would seem that Primrose was the only casualty. The memorial slab let into the wall of the tomb which was built, or rebuilt, a few years ago at the instance of old Muhammad Ali, my boatman and *moopan* (headman) of the island, was carved by men of the 'General Simpson,' a ship which was wrecked in 1863 on the north reef of Chetlat. The vessel sent to save the ship was itself lost on the reef when approaching the island at night.

In 1865 the 'Lord Brougham' was wrecked on the Cheriapani Reef and timbers of all these wrecks appear to have been utilized in construction of the island mosques. Since those days there have been no more wrecks as the shipping passes further south through the nine degree channel; but now the new Port of Cochin brings steamers to and from that port within sight of some of the islands.

One of the vivid memories of that first walk on the island was the sight of the hermit crabs (*Cenobitæ*) going about with shells on their backs, into which portable bungalow dwellings they quickly retreated when alarmed to bar the entrance with a horny claw. Housing problem completely solved! The many forms of life seen on the reef within a few minutes was astonishing. Sea slugs (*Holothurians bêche-de-mer*) were lying about seemingly inert, in sheltered places beside the rocks, and R. A. was soon at work collecting specimens, being busily assisted by a number of children attracted to this new form of treasure hunt along the shore, every nook and cranny of which was so wonderful to us and commonplace to them.

We all drank of young coconut milk, the customary hospitality in all countries where the coconut is grown and so, quietly wandering through the shady palm groves with eyes alert to notice all so strange and new, we made our way back to the cutcherry now my home for the ensuing ten days.

Next morning there was an official rat-hunt, part of the Monegar's inspection work in pursuance of the organized methods found necessary to check the increase of these pests (*Mus rattus rufinus*) which have become almost entirely arboreal and do much damage to young coconuts. A few nests were found and destroyed, some half dozen rats killed, among much excitement. The men walked up the trees without rope or other aid of any kind with little apparent effort, and their great muscular development above

the waist due to rowing, beating coir-fibre, and climbing the trees for fruit was most noticeable.

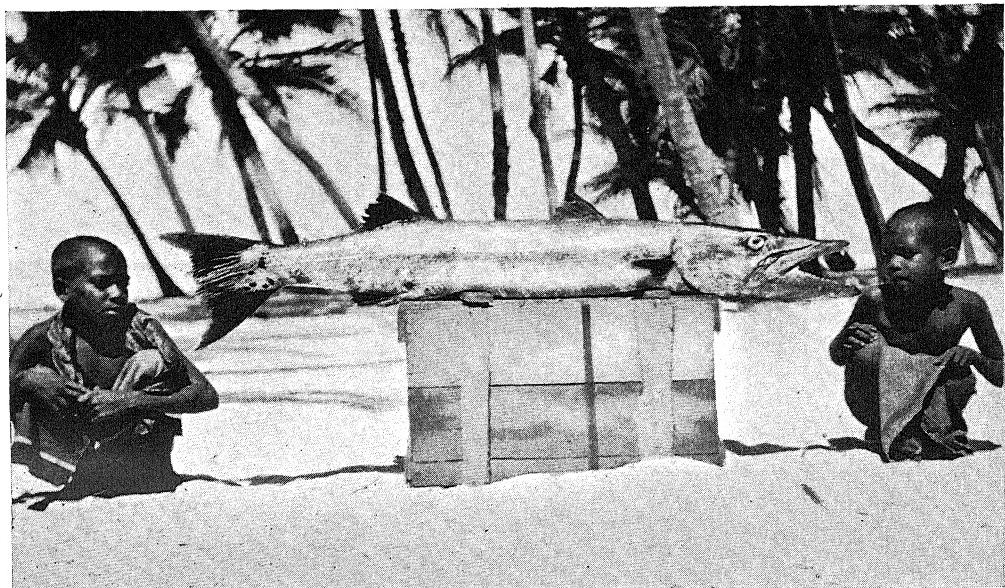
In the evening an entertainment was given by some women and girls. Sitting in a circle they beat time with the palms of their hands the while all sang to the lead of a witty lady of mature years who gave all the topical allusions suitable to the occasion : judging by the hilarious reception of the 'hits' she was highly successful !

The morning after arrival I went to sea in a lagoon boat. Several fish of good size failed to get hooked—all sea fish have very bony mouths, but a fine barracouda (*Sphyraena commersonii*) of 36 lbs. (55 ins. by 22 ins.) was captured on a trolled bait. Of much the same size and shape as a good *seir* fish he did not put up the same fight for freedom as that sporting variety of the tunny. He has a great armament of formidable teeth, as can be seen in the photograph where he is posed with two small boys ; the boy at the business end clearly registering alarm ! That evening there was another entertainment, but of a religious nature, in which men acted with great fervour. The following day the Monegar was rowed away to Ameni and we settled down to the collection of specimens and to fishing.

Several mornings producing few fish I took to going out from sunset to ten o'clock, and very beautiful it was under the moon and brilliant stars ; but even then the sport was by no means up to expectation, the best evening being nine Caranx (*C. nigripinnis*) averaging 11 pounds, all on trolled natural bait. The island fishermen also caught few fish by day or by night on hand lines and during my stay harpooned not more than half a dozen.

One afternoon a *Seir* fish was harpooned close to my boat and it was most interesting to see the preliminary play of the *poemeen* (the crude wooden imitation of a flying fish), the tense attitude of the striker when he became aware that a fish had been lured from the depths, the hurling of the heavy fourteen foot harpoon and the thud as it struck the fish. Instantly the thick coir line is torn out of the boat, the shaft becomes disengaged. Now the man wielding the sculls manages the boat according to requirements and instructions of the harpooner ; soon the fish is tired, brought near the boat, skilfully gaffed by the oarsman and lifted in. In such manner do these sporting island people of mid-ocean secure all creatures which swim in those seas—except the whale, which they leave severely alone.

Harpoons are of three kinds. The heavy 11-foot shaft used for porpoises, dolphins, sharks, rays, and the like ; the three pronged 14-foot shaft for *seir*, turtles, and such large fish as are not usually struck close to the boat ; the twelve pronged 8-foot weapon used for flying fish, *gar*, and other small varieties found at night in the lagoons and along the reefs by aid of palm-leaf flares. The prongs of this latter, which is used in a somewhat similar form by several eastern peoples, are of bamboo or other hard wood sometimes tipped with brass. These are placed concentrically—six on the outer circle and six on the inner, these last being two inches shorter than the outer ones. The shafts of all



Cheilat : A Barracouda: 36 lbs.



Collecting at Chetlat.

are of coconut wood about $1\frac{1}{2}$ inches thick in the middle and tapering to each end.

The fishermen are marvellously adept in the use of these crude but efficient weapons and quite evidently take pride in, and greatly enjoy, the sport which entails a high degree of skill. Distance, pace, refraction, direction, all have to be judged in the split second of the opportunity which may come at any moment. It is at night that the most varied sport can be obtained, the best conditions being when there is neither moon nor wind. The beauty of the scene is almost more than can be imagined; there is the reflecting mirror of the lagoon, the sparks flying from the torch, the dancing sparklets of the rippling water, the bronzed statuesque figure of the poised harpooner, the low-echoing undertones instructing the oarsmen, the thud of the weapon and the resulting jubilations of the crew. What memories all this recalls!

The reefs at any time, and more especially at night, are infested with creatures it is well to avoid: clams, octopi, sea-urchins with poisonous spines, knife-edged pieces of coral await the unwary; so on the frequent occasions when it is necessary to ease the boat over an obstruction there is always the possibility of injury to bare feet: but the fishermen seemed not to mind or take any particular care, while I was usually anticipating some mishap!

Besides harpooning and hand-line fishing beyond the outer reef nets of three sizes are used in the lagoon. The *muluvala* is of small mesh, about fifty feet long by five feet deep, worked from the shore by four men; with it small fish suitable as bait and for the family curry are caught as required. The *muduvala* is a circular casting net for catching small fish, and has no radiating strings as on the mainland nets for these would entangle in the coral. The *kadalivala* is a much larger affair and is used in conjunction with the *olavala*, this being a rope many hundred feet in length on which are tied lengths of palm leaves, the use of it being a holiday occasion.

The method was demonstrated one morning. The palm-leaf affair was loaded in equal parts into two boats which were rowed some four hundred yards from the shore by crews of a dozen men. At the selected spot the ropes were joined—the boats then returning in a semi-circle paying out the rope as they came. At intervals men went overboard to free the leaves from coral obstructions and aid the net by wading with it to scare the fish inwards; and so the boats came to shore with but two men in each of the dozen who had gone out. Now willing hands of boys and men tail on to the ropes and haul in until the semi-circle has been reduced to dimension required for use of the *kadalivala*, which is taken in a boat from one corner and payed out inside the leaf net. Soon this real net hemms in all the fish, and quickly the struggling catch is brought to the sandy shore where all stand around watching the rainbow sheen of fish of a dozen curious makes and shapes. There could be no speedy killing of the poor fish for among them were several surgeon fish (*Acanthurus triostegus*) of five to six pounds armed on either side of the waist with bone lancets of razor keenness which have been known to inflict

mortal wounds by severing an artery of the incautious handler. When not excited these weapons remain folded and sheathed, points towards the head, but are instantly erected as rigid weapons of offence.

There were several box fish (*Ostracion cubicus*) that curious handiwork of Nature which can move only two fins and tail, the scales being ossified and body square in shape. It is not eaten. Then there were one or two globe fish (*Tetronodon ballistes*) blown out like balloons with fright and having very funny faces: these also inedible. The island urchins have the cruel amusement of tickling these fish to cause them to inflate, then popping them off with a playful jump. The bulk of the fish taken were blue and yellow parrot fish (*Pseudoscarus tetrodon*) with prunes and prism snouts, about five pounds each in weight. In all there was some 150 lbs. of fish.

Along the West Coast opposite Mangalore the hundred fathom line is about 45 miles away and then the ocean depth soon increases to one thousand fathoms and over. The islands are on a chain of peaks rising from the ocean bed 6,000 feet below, but as to the probable geological process which led to these coral atolls being formed it is necessary to refer to the chapters on the subject in Gardiner and elsewhere. Immediately beyond the edges of the fringing reefs soundings give a depth of 5,000 to 6,000 feet and more!

The island of Chetlat is 1 mile 1,150 yards in length by 650 yards in width at the widest point, and contains 255 acres. The November temperature is a humid 78 to 84 degrees. The inhabitants number less than 900, males and females in almost equal proportion. There are 180 occupied houses. Most of the people are Melacheries, the class described as landless tree-climbers. Those who can read the Koran do not climb trees and are called Mukris. There are no dogs, crows, or land snakes; and though commissioned to collect specimens of sea-snakes none were to be found and they were not known to the islanders.

The few birds and butterflies are mostly migratory. The highest part of the island is not more than 15 feet above sea level. The average rainfall is 60 inches, most of which arrives in June, July, and August. The island is not so thickly grown with palms as some of the others; but the quality of coir is said to be superior, probably because it is all soaked in sea water. The palms at the south end of the island are much taller than those elsewhere but I could learn no reason for this.

In *The Blue Lagoon* (H. de Vere Stacpoole) is an account of a fight with an octopus; and finding smaller specimens in pools among the coral I witnessed the creature's methods of attack and the inky discharge by which the whole pool is clouded when it is forced to defend itself. The two-foot tentacles could be detached by one's fingers, but it could be well imagined how helpless one would be in the grasp of a big one, and they are known to grow to an immense size. The islanders use them as food and for fishing bait.

Specimens of the Giant Clam (*Tridacna*), known to grow to a weight of 800 lbs., were a common sight on the reefs, the smooth pearly-white curving lips open and ready for any chance prey which might happen into the vice-like grip, the only release from which would be a severance of the powerful muscle at the base of the shell by which it is closed: for the shells are almost part of the rock on which they are found. My walking stick thrust into the open jaw of quite a small one had to be released by use of a long-bladed knife. Deadly, absolutely, would the grasp of one be to a man caught at low tide, or when diving, for the muscle is of enormous power, nothing short of a crowbar being able to prise open or detach even a small one of ten pounds.

The lagoon is on the western side and about 600 yards in width, extending almost to the length of the island. Owing to the small variation in the tide level, which is less than three feet, the outer reef is but little exposed and it is only on perhaps two days in any one month that paddling exploration of the reef can be made; so on only one day of our ten were we able to thoroughly explore. Then R. A. added numerous treasures to his collection and I witnessed many forms of life never before revealed to my wondering eyes. My camera not being with me on that occasion I was unable to take a picture of a large sea anemone of brilliant colours which lay in shallow water: next day there was a strong breeze and deeper water, so the opportunity did not recur: how true that is of many such! Bacon has something very apt which will not be inflicted on the reader, and readers of Shakespeare will recollect a very true saying. 'He who will not when he may—', etc.

That first day of exploration on the exposed reef was of absorbing interest. Beneath almost every movable stone or piece of coral is a creature of some kind; a crab; a many-footed creature like a centipede; a brilliant little fish; a mottled eel which would rapidly undulate into a crevice, the entrance to which would be speedily barred by a snake-like head full of sharp teeth; there were also sea-urchins prickly as hedgehogs, sea-stars and star-fish; while amongst the surf of the reef a few feet away might be seen a four-foot shark. In every pool holothurians (sea slugs, *bêche-de-mer*) of several varieties lay apparently lifeless, yet containing within them commensal life in the shape of a small fish (*Fierasfer*) having this strange dwelling for a lodging. This little fish, similar to most fish except that the ventral fins are absent, issues from its host when water is ejected, retreating to safety with a returning stream. It is about as long as one's finger. One small sea anemone I found and examined. It has no bony covering and anchors its foot to a rock. It is a coral, yet secretes no coral, and consumes such life as is suitable to its digestion by sucking it in at the centre of its petal. One of the sea worms found among the coral at low tide was about a foot long with a marvellous set of feathery feelers at its mouth. It progressed like a snake and was sticky to the touch. The men said it was poisonous but, though it looked very unpleasant, it was probably harmless. Another creature impossible to investigate lived in holes

in the coral, protruding long whitish-yellow tentacles which, on being touched, were withdrawn with great rapidity : this was also said to be a harmful beast the touch of which would cause the part to swell. Many other strange forms of life were seen, and the only life above the water was a heron so exactly the colour of the background of the rocks on which he was expectantly perched as to be almost invisible. No doubt he was a very expert fisherman.

In the lagoon the expanse of water is an ever-changing picture of great beauty. The colour varies with the depth of the water and the nature of the floor, being pale green where shallow and splashed with darkest sapphire where deep pools lie; while the underlying coral rocks resemble fleeting shadows cast by clouds. Sewards is the fringing-reef beyond which the deep indigo of the ocean shows in the photographs as a line drawn across the picture. Ever is there the unceasing roar of the waves dashing over the reef, for even in the calmest weather there is a considerable surf which increases to high-tossing clouds of spray when white horses are riding at sea. Within is safety in all weathers and then the graceful island boats, fashioned in such marked contrast to the heavy dug-outs of the canoe coast (as the west coast is styled in contrast to the cataraman coast of the east side of India) are busy fishing and tending the bamboo basket traps put out for crabs and lobsters.

Into the lagoon are two entrances from the sea, that to the north being the one used as the other is very shallow. The islands are formed of coral built up from underlying banks of reef-building corals. How the banks came to be there is matter for some difference of opinion, but there must have been some upheaval as is evidenced by the masses of coral conglomerate found along the eastern face of all the island and now undergoing erosion, as can be plainly seen—and felt if you fall about on it as I did !

The fringing reefs are great banks of coral which run out into and under the sea, that on the eastern side being but a hundred yards wide and dipping abruptly into the great depths of the surrounding ocean, while the western reefs shelve some hundreds of yards before they plunge into the 6,000 feet which is the depth not half a mile away. The floor of the reef is visible at a depth of 90 feet, so crystal clear is the water of these seas, and it is along the dark indigo line of the deep ocean where the reef disappears from sight that the best fishing is to be had, for there are the big fish searching for their food. 'The little fish lie in the shallows, the big fish swim without' wholly true of rivers, is also partly true of coral seas.

All over the fringing-reefs can be seen luxuriant coral interspersed with bays of silver sand. Great trees of coral border those shining valleys, while through the water glass can be seen slowly moving fish of varied hues and strange shapes wandering in seemingly aimless fashion in and out of the coral jungle: but all are there for protection or food, and some of them such as parrot fishes and file fishes actually feed upon the coral itself

cracking the tubes like a dog cracks a bone and eating the polyps as a dog does marrow. Some of the crabs and other creatures put on a garb so closely resembling coral as to have an almost sure protection from their enemies. Certain species of crabs live at a depth of thirty fathoms which is about the extreme depth where the polyps can build.

Live coral has many very beautiful colours. Rose pink, blue, brilliant yellow, purple tipped stems of many branching forms are seen, apparently waving in the pellucid water when viewed without the water-glass, but only these tips are alive, for the coral stems and trunks are all skeletons of the dead upon which the living coral is raised.

Leaning over the side and gazing through the plate glass screen as the boat moves slowly along everything is as in an aquarium, but on what a vast scale! Marvellously are the processes of nature in its most wonderful form brought before one by such a kaleidoscopic picture. Countless thousands of millions of the tiny builders are at work forming these reefs on which have arisen islands habitable by man. Rising above the surface the coral is broken by waves and thus ground into sand; more and more sand is formed, perhaps a great storm may arise and bring added material from the ocean bed, a bird drops a seed which germinates and more seeds fall, so grass and certain species of shrubs appear and bind the sand together: a coconut is borne from the distant land and so coconut trees take root, and the question may be asked as to whether man planted coconut trees on these islands or was he attracted by the trees already established?

The fish I used for trolling-baits out at sea were of various colours. The most useful seemed to be the goat-fish (*Upeneoides*) so named on account of the beard-like feelers depending from the chin. These were cream colour with longitudinal yellow stripes. When the eel-like mackerel-coloured half-beaks (*Hemiramphus*) were used at night they were very successful; and a dark green jew-fish did good work in luring a fine red perch (*Lutjanus*) of 13 lbs. A few sharks were caught, 30 lbs. the largest, but nine of the fish caught at Chetlat were horse mackerel (*Caranx nigripeinnis*). It was very disappointing not to get better fishing when so much was expected; the fishing on the Malabar coast had been better: there 29 fish of 547 lbs., here 15 of 172 lbs.

The mornings and evenings were spent in wandering about the island looking for butterflies, insects, birds, shells, and just for the pleasure of seeing the people at work and how they lived. Only five species of butterfly were captured, all with the appearance of having been blown over from the mainland. Two kinds of bees sought nectar from the blossoms of a hardy shrub, a gecko fell from the palm-thatched roof of the cutcherry, and an occasional skink scuttled among the leaves. Dragonflies were numerous and difficult to catch; numerous crickets and grasshoppers afforded food in plenty for the several blue Rollers (*Coracias benghalensis*, Ceylon and South Indian race) which hawked among the palms.

Of birds of prey the only two observed were the Pale Harrier (*Circus macrurus*) and Montagu's Harrier (*C. cineraceus*). Some

small birds flitting among the dense foliage of the trees could not be identified, and I had no gun. There were no gulls.

The drinking water of the island is found by digging, the excavations being studded with coral stone. These places, as also the several bathing tanks made in a similar way, are very badly cared for and a cholera epidemic would take very heavy toll of life. The water had a very uninviting appearance and I saw to it that all for my camp was carefully boiled, a kerosine tin at a time. In the bathing tanks were some fresh water minnows which helped to keep down mosquitos, unpleasantly prevalent but fortunately not malaria carrying as are those on the island of Minicoy, the most southerly of the Laccadive group.

The people had few domestic animals. There were two or three cows and a few goats, so milk was known to but few of the children. Fowls were kept by a few of the more enterprising and eggs were offered for sale, but I did not encourage sale to my camp of any provisions as there was little that this isolated community could spare. There being no shops money was not much in demand. The children were insatiable for biscuits of which a ship-load would not have sufficed, for the grown-ups wanted them as well. My own fare was simple, as always when out in camp. Dal, rice, *atta*, potatoes, onions, sugar, jam, tea, butter, and the usual condiments met all requirements. It had not been difficult to arrange the forty days supply for self and servants.

On the whole the people looked undernourished and suffered a good deal from eye troubles which, it was gathered later from a medical scientist, may be due to some deficiency in diet. Leaves of the horse-radish tree (*Moringa pterigosperma*) appeared to be the only vegetable eaten. Old and young alike were affected with skin diseases. The staple food of the islanders is rice all of which is imported from the mainland in exchange for coir rope at a price fixed by Government. No coir, no rice, so all families have to be pretty constantly at work husking the coconuts, burying the fibre on the shore in prepared pits where it is covered with coral stones for about six months, uncovering these pits, beating out the fibre on blocks of wood with wooden mallets, teasing the fibre to make it ready for twisting, and making it into rope. Then it is packed into bundles of a specified weight and size, weighed into the island store room by the clerk-in-charge, and rice given in exchange. Certain stages of the work are done by women and children—quite small girls and boys taking their share, and at most hours of the day before noon the sound of the beating mallets can be heard almost as insistent to the ear as the copper-smith in India.

The meat of the coconut, the copra of commerce, is used as food—coconut rice cakes are very palatable—and the balance sold by the islanders under their own arrangements. Beyond what they get for these products of the coconut tree, and the fish they catch, they have no other principal means of subsistence. Nothing do they grow, or can they grow, in the sandy soil, yet lantana and



Chetlat Laccadive Islanders



My Fishing Boat

the aloe plant, if permitted to flourish, would soon overwhelm the little open space that exists.

The clothing of the women is much the same as worn by a similar class upon the mainland. Ordinarily the male population wears little but a loin cloth, a costume almost necessitated by the climate for any active work. Some of the men are of very fine physique, an instance being a hairy-chested fellow, one of my boatmen. I met him one night when out fish spearing and he presented a flying fish to me, one of the few seen during the whole trip. As the flying fish is much hunted by all the large predaceous fish of these seas—sword fish, bonito, and the like—their absence was a bad sign.

The life of the people is very well ordered and ruled by a simple penal code, but of crime there is little and that mostly the theft of one another's coconuts! There is certain work, such as the launching of the larger boats or the hauling up of one into a boat shed, which is a communal duty. For this, and for the daily coir and rice transaction, the people are called by a peculiar cry started from the required place of assembly and repeated from house to house. It closely resembles the howling of jackals! The boat sheds are of coconut beams and rafters thatched with palm leaves, these roofs abutting upon uprights of coral stone. The eaves are close to the ground so that the boats are well protected from the monsoon storms. The dwelling houses are of similar but neater construction and well fitted for the climate. All face north, and the walls are of coral stone quarried by much labour from various places on the island.

The Laccadive islands are sometimes visited by destructive cyclones, and evidence of these great storms is to be seen on the Eastern side of most of the islands. Great masses of coral are torn up from the ocean bed and piled to a height of many feet, where they act as rugged breakwaters. Such storms must have devastated Chetlat on several occasions. On the 15th April 1847 several of the islands were almost denuded of coconut trees, many hundreds of the inhabitants perished, and many houses were destroyed. The islands of Kalpeni, Androth, and Kiltan—the latter only 30 miles from Chetlat—were devastated, so perhaps it was that storm which piled up on the north-eastern reef of the island the great masses of coral. Since those days the population of all the islands has greatly increased: in 1795 there were but one hundred inhabitants on Chetlat, and Kardamat was uninhabited. Such storms on these mid-ocean islands are terrible visitations; coconut trees are blown about like feathers to the accompaniment of a deadly hail of coconuts.

A feeling of expectation, of something likely to happen, always accompanied the exit through the lagoon channel with the roar of the surf on either side and the sight of the swiftly moving mosaic floor of the reef crystal clear below the boat. Soon, when the rod was set and the bait trailed thirty yards behind, one had leisure to sit in quiet contemplation and enjoyment of the hour as the sun began to sink behind the great bank of clouds which arose every evening on the Western horizon. On the one hand

the foaming surf of the reef backed by the feathery palms on the further shore of the beautiful lagoon; all around the quickly changing hues of the water now looking cool and peaceful where but an hour ago it was glittering under a fierce sun; and along the horizon the enormous clouds formed massive purple battlements, castles in the air, the illusion of snow-topped mountains, static too, as if real and not unstable, so slowly did they change their shape: then the silver changed to gold as the sinking sun shot great rays to the zenith and the dying day rapidly gave way to the wonder of the tropic night.

This was the hour when one might expect to have the line torn off the reel with all the resultant excitement and expectation. Is it a *seir*, or a caranx, or perhaps a shark? One soon got to know the manner and feel of the various species. Some, like the red perch, would at once make for the floor and a coral retreat from which dislodgement would be difficult, so whenever the bait was seized it was well to allow as little liberty as possible: in anticipation of such happenings tackle has to be strong. A few good fish were lost for one reason and another but the sport was not up to what had been hoped for; it might have been better six weeks later, and should another trip be made to these seas it would be during December and January to a locality ascertained shortly before return to the mainland some weeks later. There would be sword fish, seer, bonito, perch, caranx, and other sporting fish in great variety.

At night the sea was highly phosphorescent. At each movement of the oars globules of light floated away, brilliant patches of jelly fish and other forms of marine life went past, and on several occasions large patches of phosphorescent light floated from below to remain a minute and then fade away; what this was the men could not explain and it never occurred close enough to be investigated.

I used to let the men put out a hand-line and keep themselves amused by singing chanties as we rowed along. Noise seemed rather to attract fish than otherwise; and when we occasionally hauled in the lines to light palm-leaf flares in order to try and harpoon a *seir* fish it was often that the trailing bait would be taken immediately after within a few feet of the boat. Sometimes we would get close to another boat and then the picture silhouetted in the night by the spark-throwing torch would be of a very striking description. On a future trip an automatic camera flashlight apparatus must form part of the equipment.

When a hooked fish was reeled in to be gaffed great lines and flares of phosphorescence were set up far below by its wild gyrations and all eyes would be out of the boat to judge of the size. Many were the laughing comments on the lengthy business of playing with the rod a fish which would have been summarily hauled in by themselves using a hand line, and jerked into the boat. Old Muhammad Ali used to be doubled up with laughter at the idea; and when one evening the butterfly net with a small receptacle at the end of it was skimmed along the surface of the water as the boat moved quietly under the full moon for the

purpose of collecting plankton for scientific examination, he and the crew, thinking this to be another method of the mad *Feringhi* for catching fish, laughed so that tears streamed and the merriment ceased only when the scream of the reel afforded other excitement. All that I had was strange. None of them had ever before seen a fishing reel. Said old Ali with much emphasis, 'More than seventy years have I lived, and never have I seen such a *tamasha* as this!'

It was old Muhammad Ali, headman of Chetlat, who hired to me for the remainder of the trip the use of his boat with crew of eight men and himself as Tindal, and a very excellent crew and craft it was. He was then blind in the right eye but now, alas! has lost the sight of the other from the same cause, that very common trouble among eastern people in particular—cataract. Never again will he see the foaming surf of the reefs, the marvellous sunsets, the tremendous majesty of the monsoon seas and storms known to him since childhood: but I hope again at some future time to take him out fishing and let him have the feel of a good fish on my rod.

The 'Valia Bukkari,' in which we had sailed from the mainland in 54 hours, is slightly larger than the 'Poo Odam' which is of 15 tons burthen.

All night we sailed quietly along in the 'Poo Odam'—the Flower Ship—to wake at dawn after hours of peaceful slumber in that warm air and look over the immensity of the grey of the sea shot with soft hues; there was a brief pause, then with a smile the day broke to reveal the palm trees of Bitra Par seemingly floating in the water at the northern end of a great lagoon seven miles long by three wide encircled by a ring of creamy breakers.

The main entrance is at the southern end, and there is a possible way in over the reef close to the east of the island of which I had no knowledge or would have urged we make for it; but before I realized what was being done we were inside the lagoon through a small high-tide gap known to the old man, and mighty proud he was to have found his way in! But pride has a fall, and he wasn't so perky when the wind failed entirely, for it took within half an hour of dark to kedge the boat to our destination; and the crew were wholly fed up with 18 kedges of 20 minutes each, besides rowing R. A. three miles to the island to shorten the miseries of a bad sailor, for the boat rolled much in the calm lagoon. That night I again slept on my six-by-two piece of deck, lulled by the unceasing surge of the sea on the reef, after having caught with a hand-line a 15 lb. *kaduva* (*caranx*) and a red perch, both of them very pale in colouring, the result of habitat on the sandy floor of the lagoon.

Next morning tents and everything else required was landed and camp pitched among the palms. Bitra is uninhabited, except for one family from Chetlat which lives there during the fair weather months to look after the coconut trees and make sugar from the palm juice. In one of the pictures the man is seen walking up one of the trees near my tent to take away in a bamboo bucket the juice which has collected during the night in the small

coconut gourd placed the previous evening beneath a cut made to receive it. The palm juice has to be collected in the early morning as these Muhammadan people may not drink the potent spirit which can be made from the fermented liquid. The trees belong to Chetlat, but all the islands have equal fishing rights, so I was not surprised when the caretaker complained that a fishing party from one of the distant isles had raided all the coconuts.

This man had pigeon-toed, widely splayed feet well adapted for the climbing of coconut trees—which is done without extraneous aid of any description. I saw some similar feet at Chetlat, and it is likely that the palm-climbing done from early youth causes this adaptation which, were it not that the women never climb trees, would probably become an inherited characteristic. All the men of the crew could walk to the mast head in just the same effortless manner.

The family occupied a house, on the eastern side of the island, of the usual coral-stone palm-thatched type with a well close by. They lived in the utmost squalor, in the dirtiest state imaginable as to surroundings, and the well was full of leaves and debris. At the south-east corner of the island is an excavation about two feet square containing somewhat brackish water. This was at once cleaned out for use of my camp and we soon got used to the taste of it; but I liked it best, or disliked it least, made into tea. During the monsoon months both these supplies are too salty for use, and until the island has much increased in size—it is now but 28 acres—it will be likely to remain uninhabitable on this account.

The night was cool and there were no mosquitoes; rats and crabs did not trouble me, but my servant said they tried to penetrate his curtains and share his bed! I had feared the mosquitoes and sandflies might be troublesome as much of the island is covered with an evergreen bush (*Scaevola Koenigii*), called *kanni* by the natives, which grows in clumps like a rhododendron. There was also much of a coarse tussocky grass, two kinds of convolvulus—white on the bushes, purple where it spread over the sand—and a few other grasses. The island is 200 yards wide at the broadest part and 1,100 yards long. There is evidence along the eastern shore of some great storm having torn large blocks of coral from far below, as is seen on Chetlat to a greater extent. The coconut palms on this island were definitely not sea-borne but planted by the islanders.

As at Chetlat, so here, we had only part of two days on which the tide permitted exploration of the fringing reef; then a large area was uncovered to the north-west and many treasures gathered by R. A., assisted by the boatmen and my servant Rangaswamy who had become an ardent collector of shells. Nothing very rare in shells was found. There were many large *Pterocera chiragra* and *P. lambis* (*Trochus*) from which pearl buttons are cut and the flesh of which, as also of the octopus (vern: *appalu*) found in plenty on the reefs, is eaten by the people: this latter has a pleasant shrimpy taste and the tentacles are used for baiting hooks.

A good specimen of *Mitra episcopalis* was found in the sand at the south end of the lagoon, but on the whole the shells were rather disappointing as the islanders have taken to collecting for sale in the Mangalore and Calicut bazaars. A heart-shaped sea-urchin, with shape of a star fish impressed on the carapace as by a wax seal, was an interesting find; as also a composite coral snell, a *cirripod* of the crab family of which relationship one would never have suspected it.

It seemed apparent that the south end of the lagoon is filling up, as a considerable area is exposed at ordinary tide, and a fair sized bank about fifteen feet high is always above sea level. On this were a number of sea gulls, some terns, and a few migratory waders. Less than a hundred years ago sea birds bred in great number on Bitra itself but owing to persecution have long since ceased to frequent the island for any purpose. Rats (*Mus rattus rufinus*) are the only mammals; and the only birds seen were a water rail, unidentined, which crept among the bushes close to the tent, a blue roller (Ceylon race), and a Montagu's Harrier. Shore birds began to arrive soon after we did, so before we left I had seen whimbrel, golden plover, avocets, stints, herons and a large black and white stork. The only butterfly seen was a very tired specimen of *Melanitis ismene* which settled at the very door of my tent after the whole island had been searched for several days. Dragonflies were numerous.

A large turtle (vern: *miragam*) came out of the sea one night and laid a great store of eggs which the men soon dug out of the sand. Had they secured the turtle it would have been quickly boiled down for oil with which to preserve the woodwork of their boats; and a horrible sinell there is when this operation is in hand. The large net (*ola-vala*), brought from Chetlat for the purpose, was dragged in the lagoon with much the same result as before, the bulk of the catch being jew fish (*Pseudoscarus dussumieri*) most of them about 11 lbs. in weight. There was also a curious fish with large luminous eyes, a near relative of the cuttle-fish, and some surgeon-fish (*Acanthurus triostegus*). All these, except the inedible box-fish (*Ostracion*) and some spiny globe-fish, were cleaned, split, and dried in the sun on sticks placed between poles stuck in the sand. This was also done with the fish I caught outside the reef, so soon the whole place reeked of the oil-exuding flesh covered with blue-bottle flies, and it was a marvel to me how it ever became fit for consumption. As at Chetlat we found no sea-snakes which are apparently absent from these seas though so numerous close to the West Coast.

The fishing was a little better than at Chetlat, but not much. There, 15 fish weighing 171 lbs.: here, 37 fish of 426 lbs. which was far below expectation, as to size at any rate. *Seir* (*Cybium conumersonii*, vern: *ayakura*), were seen once or twice leaping high out of the water in furious pursuit of shoals of small fish, but only one was taken, and that with the harpoon. The largest fish was a 90 lb. shark (*Carcharius*, vern: *sraju*) in which were four young ones 22 inches long. Another shark which may have been about the same size got off after a long fight, the hook

coming away for no apparent reason. Most of the fish were *Caranx* (*C. marginatus*) of two varieties; one, (vern: *molayam*) having a larger eye than the other called *kannam*. They averaged 11 lbs., the largest being 19 lbs. The red perch were *Lutjanus* sp. and a lovely green perch (*Lethrinus*) of 5 lbs. Even with the aid of Dr. Day's well-known work on fishes we did not find it easy to make correct identifications of the 47 specimens collected at the two islands.

All my fishing was by trolling any species of small fish netted in the lagoon or along the reefs, and most of it after dark. It seemed better to so mount the bait on a single hook as to prevent any spin: this I also found when fishing on the West Coast of India. One day the rod gathered a fair harvest of fish. There were two sharks of 40 and 22 lbs., two *Caranx* of 21 and 7 lbs., one gar-pike and two red perch, one purple *ballistes* (*Erythrodon*), and three small perch taken by hand line from a great depth, their eyes popping out in surprise at such an adventure! These were *Serranus* *mineatus*. The method of sinking a baited hook was to hitch a coral stone on to it by means of a narrow strip of palm fibre; when at required depth a sharp jerk released the stone.

The Research Assistant was indefatigable at his work. The opening up of all fish taken was always done for examination as to parasites and, almost without exception all were infested with one kind or another, the harpooned *seir* fish contained a parasite as big as a thrush's egg—named *Trematode*. It quite put me off eating fish, to know they harboured such creatures.

With the new moon of the 26th November R. A. had certain ceremonies to perform and my boat people commenced the Ramzan, the Muhammadan month of feast, by having a day of rest from seeing me catch fish; but after that they claimed the permitted dispensation for travellers so far as abstention from water is concerned.

I always let the men have a hand-line out when I was trolling, and old Ali used to like pulling the line off the reel to get out the usual thirty yards and occasionally feel the pull of the bait. Several times he had the thrill of a taking fish and the feel of a fish on a rod the like of which he had never seen in all the long years of his life. The reel was a great source of interest.

Several of the men had inflamed eyes and were greatly pleased with the cardboard shades I made for them, so much so that they wore them at night when out at sea!

One day there was great excitement when we were returning to camp across the lagoon. The men suddenly pulled at racing speed; then one of them dived overboard to come spluttering up and ask for one of my large hooks on a hand-line; down he dived again and away tore the line with a big fish at the end of it! Soon the fish was hauled alongside and lifted in with the gaff: 36 lbs. *Chilenes undulatus*, called by the men *chandni bu-la-la*. 'A most noble jew fish' as Tom Cringle said to Mr. Wagtail.

This peculiar method of fish catching was explained to me. The fish is seen in the clear water to swim away and its habit

of taking refuge in a clump of coral is known, also that it is so frightened that it will stick its head into a crevice and not attempt to swim off when a man dives after it. The first dive locates it, the second time the bend of the hook is pushed gently along the side of the gills until the corner of the fleshy mouth is reached, when an inward motion with a quick pull sends the point in and the fish is hooked! One day we went to the south end of the lagoon and three more of nearly the same size were secured in a similar way. They have protuberant lips like those of mahsīr and a single row of teeth, the dog-like canines projecting at a forward angle. The tail is broad, there are curious fleshy ridges along the dorsal and ventral fins, and on the shoulder is a hump reminiscent of that on Indian cattle: on the blue scales and gill-plates are rusty-red linoleum-like patterns.

The dazzling white of the coral sands necessitates glare glasses when the sun is out, and when it is not out. During the hours of glare and heat there is not much life to be seen, but as the evening closes in the hidden population of the sands issues forth. Where the sand was before smooth, or perhaps rippled by the ebbing tide, hundreds of crabs emerge from their burrows to seek food and scuttle about in all directions, nipping the bare toes if one stands still for but a moment, and difficult to avoid treading upon if walking quickly. They are of several species varying from yellow to olive-green or grey; and many are really beautiful in the patterned designs upon their bodies. Some have periscopic eyes (*Ocypode ceratopthalma*), eyes on stalks which they lay backwards when crouching for concealment and raise to find out if all is clear for a forward movement. There is nothing new under the sun! If pursued they run into the water where they crouch in imagined concealment and are easily caught between finger and thumb.

Besides the crabs there are other concealed creatures. Sand shell-binders form long casts which are very difficult to extract unbroken, and even more difficult to keep undamaged for museum purposes. And then there are the *Sabellae* which live in colonies and can be seen at low-tide like a number of tubes; when covered by the incoming tide a beautiful fringe composed of the gills comes out like a plume of feathers. One knows that behind all one sees is a purpose and a plan, but how to arrive at the truth? Marvelous are those scientists who have unravelled so many of the secrets of Nature.

The magnificent lagoon of over twenty square miles in extent is an immense tropical aquarium in which can be seen, as we move quietly along in the boat, every kind of coral and fish of many brilliant hues and strange appearance. Football stockings! School Blazers! Anything of that kind. So unused are they to any alarm that one can watch them unobserved. No doubt there are voracious enemies in the seeming paradise—indeed I often saw great splashes of feeding fish amongst the partly submerged clumps of coral against the reefs—but out in the lagoon all appeared peaceful in those pellucid gardens. Here is a place where scientists could spend four or five months in Nature's

Wonderland in perfect security as to climate and weather, and at a small expenditure.

Those marvellous corals! The coral polyps cannot live above the surface, so when the structures reach just beyond the ordinary action of waves they die. It is only the upper part that is alive, so the living part of the reef and the clumps of coral in the lagoon may be only a few inches thick, and all below that level dead as ancient rock. Growing after the manner of trees budding and branching the appearance of the coral seen below the surface—or with the water-glass in the deep transparent water over the reefs, is aptly likened to a forest of trees.

There are many varieties of coral and all are not of this branching description. There are star corals and brain corals, mushroom and fungoid corals, to mention only a few, which are not reef-building and can be picked up in both dead and living state as one paddles about, many of them showing wonderful geometrical designs most fascinating to study under a magnifying glass. The growing tips of the branching corals are rose-pink, brilliant yellow, delicate blue-green of many hues, creamy white, purple, and even black; and when the reef is exposed at low tide the staghorn coral jutting in large patches above the surface has the appearance of gorse upon a common.

Some pieces of red coral we found, *tubipora*, of which the live growth has not been discovered on the Laccadives. It is known on the east coast of Africa, and perhaps grows at a great depth, for some of the reef-building corals work at as much as thirty fathoms, and fragments may have been torn from the ocean bed at time of great storms. It is not plentiful.

All too soon our allotted time came to an end; the ten days' rice was finished; we were overdue to arrive at Kadamat island away to the south-east; so on the afternoon of the 2nd December we anchored outside to await the breeze which would arrive soon after dark. For the last time I gazed over the placid waters of the vast lagoon.

All through the starlit night of the 2nd December we sailed over calm seas from Bitra and at dawn next day sighted the five mile line of palm trees denoting Kadamat, while a few miles to the south could be seen Ameni, the principal island of the Northern Group of the Laccadive Archipelago.

Soon after daybreak the night breeze died away and it was but slow progress we made, the tedium being diverted by the sight of a school of dolphins for which the harpoon was quickly made ready; but we were not so successful as the men of Barlow's ship in 1661, ' . . . , and one day there came two dolphins about our ship and in the evening one of our men struck one of them with a "fisgige"', and he draws for the reader quite a good picture of a dolphin and a flying fish 'on which the dolphin doth prey for his food many times.'

Drawing nearer to the north end of the lagoon we were within hail of a one-man fishing boat which came to us for exchange of news. He had a flying fish trailing behind on a stout white cotton hand-line in hopes of sword fish or *seir*. No doubt he did not

wish that a dolphin should take his bait, for it would be more than one man's work to hold and harpoon one of those vigorous creatures : ' . . . and not long after we took a fish with a hook and line which weighed about sixty pound, which had a long snout or bill, of two feet long, which we ate, he being very good meat,' that would have pleased him better !

At last, we made the entrance of the lagoon, and slowly gliding in sailed and poled along for two and a half miles a few yards from the edge of the sandy shore, accompanied by some of the people curious to see the white man whose visit to their island they had long anticipated. Opposite the centre of the island we came to anchor, to land amidst a concourse of the inhabitants headed by the Muhammadan Hospital Assistant who had come across from Ameni on inspection duty. Soon we gathered the local news—a rice boat had just arrived from Mangalore and there were letters for me; a *seir* fish was harpooned yesterday; a big sword fish was speared last week; bonito had not been seen for some time; the Monegar at Ameni wishes to have early news of my arrival.

Soon we were comfortably housed, I in the Cutchery—the Court House of the Magistrate, the Research Assistant in the School building now closed for the Muhamram. Now that we had arrived at this populous island of 900 inhabitants my crew had to strictly observe the fast of Ramzan so could not be reasonably asked to spend long hot hours out to sea: a mental note was made that a visit to the islands should not coincide with any religious feast or fast.

The first day, however, I went out fishing, and was fortunate in witnessing an unusual affair which is probably seldom seen by white people. In the early morning we rowed across the shallow two-mile width of the lagoon to cross the reef at high tide; then, letting out thirty yards of line from the reel, two caranx of the same large-eyed species taken at Bitra were caught on the small yellow-striped goat-fish (*Chilenus sp.*) which was the bait most commonly obtained here. We failed by twenty feet to cut off a porpoise undulating on the surface—the harpoon was not ready. How often does the sportsman, or the photographer, miss opportunity from not being ready ! Then a turtle, too carelessly stalked, dived as the boat approached, and a second attempt also failed.

Now came the commencement of a memorable hunt. A long way off some men were playing the *poemeen*—the dummy flying fish—to entice *seir* from the depths beyond the edge of the shelving reef, and from them came loud shouts the purport of which, understood by my men, caused great excitement. Racing to the scene we found a school of porpoise rolling about bewildered by the noise of several boats endeavouring to encircle them. I thought they would be harpooned, but that was not the game. Soon other boats came up, and with fourteen boats joining in the hunt the shoal was hemmed in towards the reef and herded in the direction of the main entrance. There was a great shouting and banging of oars on the water and thumping of thole-pins amid great

excitement. At this time I took a photo of the men, and again of the poor porpoises confused and not knowing where to go.

Now the shoal is in the entrance channel to the lagoon, the boats close in, the shoal is cut off and forced towards the shallow water near the shore. Now from each boat leaps a man with ready knife, rapidly each poor helpless wallowing beast is slashed behind the head, stabbed in the side, and in a few minutes the beautiful light green water of the lagoon is crimson beneath the blazing sun. All this is done with exulting shouts amid great excitement, and now the men stand around, hand on hips, watching the poor stricken inoffensive creatures pumping out their heart's blood while threshing round and round on the coral stones in their death agony. In the photographs the result of this is written on the hides. One, badly wounded, escaped over the reef to the sea, but being quickly pursued by seven boats was harpooned and towed back to lie with the others.

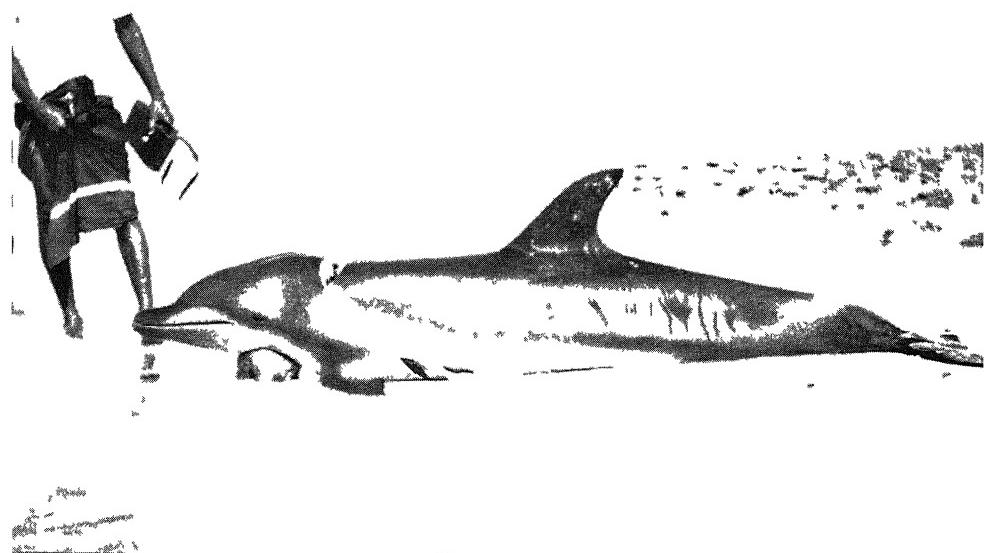
Eleven had been killed, ten porpoises, of which one was a young one of about 200 lbs., and one dolphin. I estimated that not less than 6,000 lbs. of meat had been secured within five minutes! No wonder the men had been so excited, for it would seem that it is not often the porpoises are found in such a favourable situation for a drive. The last occasion was said to have been five years previously.

As soon as the turmoil had calmed down there were whisperings and glances in my direction and I at once saw what was afoot. Backshish! From me! Why? I told them, by signs not to be misunderstood, 'nothing doing!' For why should I, as good a shouter and banger as any of them with my crew of six men, why should I pay? And just then one of the men trod on a sole concealed in the sand so there was other distraction, and the fish being soon captured I claimed it for my breakfast. 'My backshish', said I, and they all laughed.

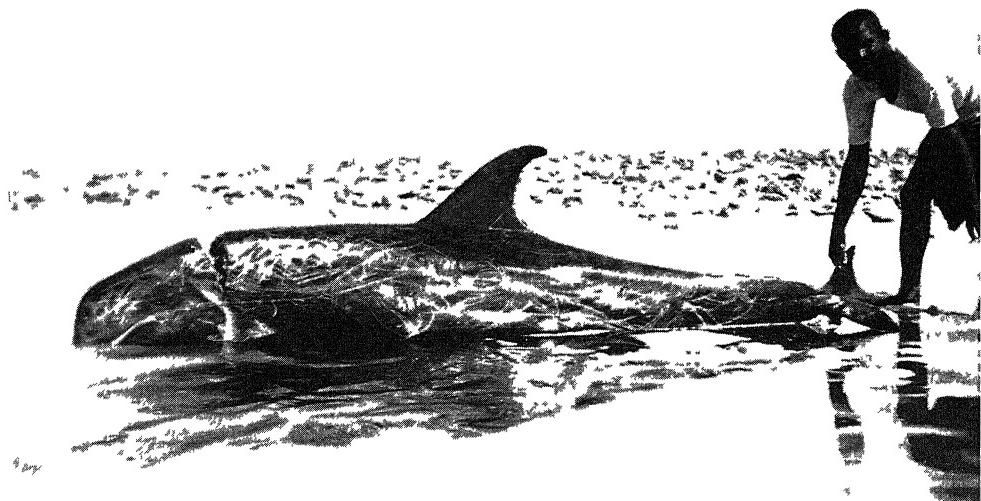
The porpoises were common porpoises (*Phocaena phocaena*), and the dolphin the common dolphin (*Delphinus delphis*), a cetacean, or marine mammal. It is strange that this latter should have been with the porpoises. Perhaps, like the famous New Zealand 'Pelorus Jack', he preferred to live a lonely life or have the company of cousins rather than nearer relatives. There are nine species of cetacean in the Arabian Sea.

That afternoon the whole island was festooned with strips of the dark-red flesh, so the people had a great feast after sunset, renewed in the early hours of the morning in anticipation of the long day of abstention from food and drink. It had been a most blood-thirsty sight to witness, and strange to see these men now Muhammadans, but many of them markedly Hindu in appearance, savagely frenzied in the murder they did. In 1795 this island was uninhabited and it is probable it was peopled by converts made in the time of Tippoo Sultan of Mysore.

Leaving the people to the division of their spoil I walked quietly back to camp along a winding path beneath the shady palms. It was pleasing to see knee-high grass and a few quietly grazing tethered cows and to note that the people of this island are



Kadamat : A slaughtered Dolphin.



Kadamat : One of the ten Porpoises.

obviously better off and better nourished than those of Chetlat. The houses are of the same description—coral-stone walls, beams and rafters of coconut wood, palm leaf thatch—each in its own compound, as on the mainland.

The palm-trees appeared more flourishing; and besides the trees common to other islands there are other mainland varieties, mango, tamarind, pipal, banyan, casuarina, but only quite a few which appear to have sprung up accidentally. Several coral sand-stone quarries were seen in use. This stone is of a beautiful whiteness when hewn and fairly soft, becoming hard when exposed to the air. Along the lagoon shore are some thickets of the sweet-scented palm (*Pandanus odoratissimus*) so well-known among the backwaters of Travancore, and within the roomy boat-sheds were interesting specimens of island shipbuilding both complete and on the stocks. I saw very few butterflies.

There are not many who can recollect the great Krakatoa Eruption which occurred on the 27th May 1883 in the Sunda Straits. I have a clear remembrance of the impression made on my mind at school in England when news of it was received. The noise was heard over a radius of two thousand miles. A friend of mine, then on a plantation in Ceylon, thought guns were being fired at Trincomalee. Ashes obscured the sun over an area of a thousand miles and dust fell as far as South America. Pumice-stone, which occasions this mention of the catastrophe, drifted far and wide over the seas and much of it used to be picked up on Laccadive Island shores. I found some on Kadamat, but most of it has disappeared.

In the evening I went out fishing, while R. A. wandered about on the eastern reefs with an attendant gang of urchins in search of specimens of every description.

Sailing down the lagoon close to the shore it was noticed at one point how the coral conglomerate on which the land has been formed is being worn away like a breakwater merely by the gentle lapping of the lagoon wavelets. There are few houses to be seen as they are built inland among the palms for shelter from the great storms of the monsoons which attack them from the east and west. The island ends in a sandspit on which were a number of gulls, also some migratory shore-birds and whimbrel. The exit over the reef is by a somewhat difficult channel and outside we found a number of boats from Ameni on the same quest as ourselves, so it is evident this is a well-known fishing ground. Ameni is about five miles away, with a deep channel between; and though so near, the islands can have no inter-communication during the south-west monsoon.

It was nearly dark by the time we were ready to fish, and very soon old Ali hooked a big one. He wasn't ready, also his line not well coiled, so there was a check, and he received two deep cuts on his little finger while the thick cotton hand-line broke near the trace of annealed brass wire: so away went the fish with one of my best hooks. In all countries fishermen have their own fancies as to gear. In these Islands all nets and lines must be of white cotton—because of the clear waters and white sand say

the people—but very conspicuous to my mind. In my experience a *black* line is less noticed by fish than any other colour.

There were not many fish about. A 12 lb. perch afforded good play, and the men caught a few small gar-pike, using sections of octopus tentacles as bait. Other boats were hailed for information as to sport obtained, and one of them having got a sail-fish when on the way from Ameni we rowed off to see it. Lighting the lantern I was thrilled to see the lovely fish lying at the bottom of the boat. Upwards of seven feet in length, including the sword of 22 inches, the beautiful Prussian-blue back fin which gives it the local name of *ola-meen*—*ola* meaning a palm leaf—was spread for my inspection. It was for such a fish I had been hoping in vain. Some other time I will perhaps be more fortunate. Flying fish is the bait to use and these were very scarce.

When we returned over the reef we met a strong wind from the north-west so three of the six men towed us along the three miles to camp. A rice boat had arrived with letters from Mangalore, the news including the election of the National Government by a large majority and the death of Admiral Lord Jellicoe. It was midnight before I slept on my camp bed under the stars.

The 'Chetlat' came over from Ameni to take R. A. and me to spend the day there as guests of Mr. A. M. Khan, the Magistrate and Monegar of the Northern Group of the Laccadives. The crew of twelve sang rousing choruses as they rowed lustily along, one of these being 'O ! Bela ! bela-illa-ela, O ! Bela, bela il kandai' in response to tuneful verses sung by one of the rowers as a leader. With the boat were two influential men, Muktesars (Assessors), of the Magistrate's Court, who sit with him during the trial of cases—an excellent system.

It was very interesting to enter the lagoon and see at close quarters the island on which the notorious pirate, Captain England landed in the 17th century after his victory over the French ship 'Cassandre' and permitted his crew to indulge in wild saturnalia of license and rapine. They destroyed coconut groves, set fire to the houses; so that even to the present day, it is the custom of the people to assemble on sight of a strange sail.

Accompanied by an interested crowd we walked with the Monegar to see the principal Mosque and so, beneath the shade of bread fruit trees and palms, to the eastern shore where the attendant people were photographed; then, after partaking of the usual hospitality of coconut milk, we returned along the Seshadri Road, a pathway three miles six furlongs in length, which was made in 1927 and named after an Indian Collector of that name. Its useful purpose is to provide the much-needed definite walking exercise. Mr. Khan is an energetic sportsman so I enjoyed a game of tennis with him and two of the islanders who had taken to the game under his tuition.

This island is even better wooded than Kadamat. There are many fine trees and the people seemed prosperous. The houses looked like small farmsteads. On none of the islands are dogs tolerated; nor, except on Ameni, Kalpeni, and Androth, are there any crows. It is a strange fact that no crow has ever been seen

on Kadamat though separated by only five miles of sea. The largest boat is of 35 tons burden, and boat sheds as long as 87 feet. The rainfall is 60 inches, mostly in June, July, August; July is the wettest month. There are 400 occupied houses containing 2,500 people. Sexes are in equal proportion.

Having much enjoyed our interesting visit and the kind hospitality of Mr. Khan, we were rowed back next day in the 'Chetlat', seeing some porpoises on the way. The jovial Muktesar, Avakal Ibrahim, remarked that he was as heavy as a porpoise and was quite disappointed when I proved to him that he could not weigh anything near 600 lbs.!

It was seldom that the wind was too strong to permit fishing outside the lagoons. For two days at Chetlat no one had ventured out, and on one day at Kadamat the wiseacres shook their heads. My boatmen, however, said it would be all right so out we went on the evening of the 6th December crossing the reef as if on the way to Ameni. It was blowing rather hard, and once outside I rather wished myself back again! The white-crested waves looked enormous as the boat fell into the troughs between them where nothing but the angry onrushing water could be seen as I faced the stern. Seated on the floor of the boat I could touch the water with my wrist resting on the gunwale and now and again a splash would curl in from that mere hand's breadth above the surface. When a fish seized the trolling bait and tore the line screaming off the reel I was quite glad it was not securely hooked! The setting sun lit up the heavy clouds to the west in a golden glory and I was relieved when the men explained by signs that no rain would come and the sea would be more quiet to the south of the reef. Confident in their knowledge of the signs of the weather, and the management of the boat they had almost lived in since their earliest days, and that they were as fish in the water which, to a landlubber over imaginative of possibilities in such a situation, seemed eager to engulf us, the men were assured and happy in that desert of angry waves. Indeed I was equally happy—when we had the shelter of the reef!

These islanders are primitive people in many ways. There is the matter of stinking fish. A bait had been left on a hook from the previous day and having been tied on with cotton had to be detached. My proffered scissors were rejected and the threads bitten through, the horrible morsel having necessarily to be pressed against the lips for the purpose. On such occasions I would say to old Ali Muhammad 'Barabar nahin' and he would reply 'Bar-r-rabar' rolling his r's, then I would say 'Hor-r-rible', and we would both laugh. He had a few words of Hindustani having picked these up somewhere on the coast.

On the last evening a flying fish had been obtained as bait and a Kadamat man made a very neat parcel of it by means of leaf fibre as thread and a bit of wood as skewer to keep the lips closed, a method stored in memory in case of need. No sword fish were found. I caught a red perch of 14 lbs., a barracouda of 18 lbs., three caranx 9, 9, 8 lbs., and so ended the fishing for this trip with a total of 17 fish of 122 lbs., for Kadamat and 69 fish of

720 lbs., for the three islands. All far below expectation, as before remarked.

Through an interpreter I learnt a little of the customs of the people. I liked their manners, and was always on good terms with them. Divorce is easy, on Chetlat at any rate, where husbands and wives have experienced several alliances. Divorce is mostly wanted by the wives. If the wife insists the husband has to divorce her but may take back all the jewellery, clothing, etc., which he has given to the woman as dowry. No doubt this acts as a check to errant fancies!

On the evening of the 8th December, at 8-30, I saw a wonderful meteor of a lovely brilliant light of many millions candle power and many colours. It appeared quite close, but there was no report of impact as is usual in such cases. Perhaps it was noticed in India.

On the morning of the 12th the Monegar came over in the 'Chetlat' to see us off, and by 12 o'clock we were out of the lagoon heading for Mangalore a hundred and fifty miles to the north-east. Winds were contrary so we did not get along very fast. On the 14th we were becalmed for some hours, and the dingy coming alongside several fish were seen beneath it. One was quickly caught and proved to be a sucker-fish (*Echeneis*), a curious creature which travels as an uninvited guest attached to a shark, or other big fish, or to a boat. The sucker is a ribbed affair, a sort of extension of the dorsal fin to the head, and when attached to a man's leg, which was the test made, will stand a pull of 16 lbs. Put into reverse gear it is easily detached. At that time also an enormous dorsal fin moved along four or five feet out of the water at a distance of several hundred yards, but what creature it belonged to we could not make out; perhaps it was a Whale Shark (*Rhineodon typicus*) which usually swims near the surface with part of its dorsal fin exposed.

It was not until the afternoon of the 15th December that we landed after a very slow voyage of seventy-five hours. I was tired of my small deck space of six feet by two—no room for a camp bed—and R. A. dead to the world on account of sea-sickness in the rabbit hutch beneath the poop. On getting ashore he could scarcely stand, and took some days to recover. He had worked very hard at collecting all sorts of specimens, and when these have been sorted out and classified with the assistance of the various experts in the different fields of science, intended to publish the results of the trip in the form of a Bulletin of the Madras Government Fisheries Department, but this has not yet been done.
(3-4-1940.)

It was sad to part with old Ali, feeling as I did that the cataract operation on his left eye would be probably unsuccessful. A nice old man. We had much enjoyed every hour of the trip. Someday I hope to repeat this memorable adventure and may be get hitched on to sword-fish, saw-fish, and sail-fish, all of which inhabit these seas, of the angling possibilities of which nothing is known as, previous to my visit, there is no record of any sportsman having visited the Laccadives with 'rod and reel'.

Those who wish to know more about the geology, zoology, botany and other facts concerning the Laccadives may refer to Alcock's 'A Naturalist in Indian Seas', to 'Botany of the Laccadives' published in the Journal of the *Bombay Natural History Society*, Vol. viii, pp. 268 and 460, Vol. viii, pp. 57 and 488; and to two sumptuous volumes by Gardiner on *The Fauna and geography of the Maldivian and Laccadive Archipelagoes*, obtained on loan from the Zoological Survey, Calcutta. Mr. A. O. Hume visited the Islands in 1875 and published some articles of interest in *Stray Feathers*. Mr. F. N. Beets of Coorg, an ornithologist, visited the Northern Islands for a fortnight in February 1938. His account of that visit, accompanied by a list of 44 birds, will be found at pp. 382-387 of Vol. xl of this *Journal*.

NOTES ON SOME BRITISH INDIAN OTTERS, WITH
DESCRIPTIONS OF TWO NEW SUBSPECIES.

BY

R. I. POCOCK, F.R.S.

British (Natural History) Museum.

There has been greater confusion over the names and characters of the Otters of British India than of any other group of mammals inhabiting those districts of the Oriental Region. It is not my intention to enter fully in these matters in this paper; but it is necessary to explain that the three species admitted by Blanford, following Thomas, in the Appendix to his volume on the Mammals of British India, p. 602, 1891, are now referred to the three genera. *Lutra*, the so-called Common Otter, *Lutrogale*, the Smooth Otter, and *Amblonyx*, the Clawless Otter. They are found in India and Burma and far to the east and south-east of the latter country; but I am here principally concerned with those occurring in India itself.

An interesting point connected with their distribution in Hindostan has come to light from a study of the skins and skulls obtained by the collectors for the Bombay Mammal Survey. The three are found in the Himalayas and adjoining districts of Northern India and also in Southern India; but the only one that occurs over the whole of Central India as well is the Smooth Otter (*Lutrogale*). The distribution of the other two is discontinuous like the distribution of the Thar and the Yellow-throated Marten.

Not unexpectedly comparison between specimens from the Himalayas and the hills of Southern India shows that they can be sorted into distinguishable local races. In the case of *Lutra* names are available for both series, the South Indian form being *Lutra lutra nair*, Cuvier; and the best known of the three Himalayan races I admit, *Lutra lutra monticola* Hodgson, a larger, lighter coloured Otter. Nothing further need be said about these, except that Pohle gave the name *ceylonica* to Ceylonese representatives of *nair*. This is a synonym of *nair*, since the trivial difference on which Pohle relied breaks down both in Ceylonese and Indian skins.

The Southern Indian race of the Clawless Otter (*Amblonyx cinerea*) requires a new name. There are, in my opinion, three admissible races of this otter, namely (1) typical *cinerea*, described by Illiger in 1815, which is found in Java and other parts of South-eastern Asia, the type being from Batavia; (2) *concolor*, the type of the genus *Amblonyx*, which was described by Rafinesque in 1832 from the Garo Hills, Assam, and ranges from Upper Burma westwards at least to Kumaon, *indigilata* Hodgson and *sikimensis* Horsfield being synonyms of it; and (3) the new form described below.

It may be added that the northern Indian and Burmese race *concolor*—a name with which Blanford was unacquainted—differs from typical *cinerea* in having on the average a smaller, less muscularly moulded skull and the pale hue of the cheek and throat

more extensive posteriorly, and more sharply defined from the dark hue of the head and nape above it. The general colour of the upper side is drabby, greyish, earthy or rufous brown in fresh skins.

In addition to a number of old skins in the British Museum from Nepal (Hodgson), including the type of *indigitata*, from Bhutan (Pemberton) and Sadiya (Cockburn), I have seen several, comparatively fresh and unfaded, obtained by the Survey from the following localities:—Naini Tal (Crump); Tura in the Garo Hills, 1,400 ft. (Wells), of special interest as a topotype of *concolor*; Hot Springs, 2,400 ft. and Jowai, 4,500 ft. in the Jaintia Hills (Wells); Dabadubhi River, Golaghat, 250 ft. (Wells); Dikhu River in the Naga Hills, 2,000 ft. (Mills); Pwepi in the Chin Hills, 5,000 ft. (Shortridge); and during the current year, 1939, R. Kaulback has sent me half a dozen specimens from Sumprabum, 1,500 ft., Htingnau, 2,500 ft., Nchangyang, 1,500 ft. and Nanhkang 1,500 ft., all in 'The Triangle', Upper Burma, approximately 26° N. and 97° E.

Ambonyx cinerea nirnai subsp. nov.

Locality of the type.—Virajpet (Virarajendrapet) in South Coorg, 3,000 ft.

Distribution.—The hill ranges of Southern India.

Distinguished from the foregoing race, *concolor*, by the noticeably darker hue of fresh skins, the upper side being very deep chocolate, almost blackish brown, without the paler greyish, drabby or rufous brown hue of the Northern Indian and Burmese form.

Before the Mammal Survey was started, this otter was represented in the British Museum by a couple of unsexed, undated and now faded skins, presented in 1867 by F. Day and merely labelled 'Madras', meaning somewhere in the Presidency. In addition to the type, an adult ♂ collected by Shortridge, the Survey secured specimens at the following localities: Haleri, North Coorg, 3,555 ft. (Graham), a specimen which I have not seen, the Palni Hills 5,800 ft. (McCann), and Ootacamund in the Nilgiri Hills (Gosse). The two from the last locality are a little paler than the type; but a series of four from the Nilgiri Hills recently sent to me by Major Phythian Adams resemble in their dark hue the type and the skin from the Palni Hills. This last-mentioned skin is exceptional amongst Indian skins in resembling Javan skins of typical *cineraria* in the colouring of the cheek and sides of the neck.

The sub-specific name chosen for this otter is, according to Blanford, Kanarese for the other South Indian Otter (*Lutra lutra nair*). But no doubt it applies to the Clawless Otter as well, since Shortridge found them fishing in the same waters in Coorg.

Lutrogale perspicillata Geoffroy.

(*The Smooth-coated Otter*)

This large Otter, hitherto quoted in the literature on British Indian Mammals as *elliotti*, *macrodus*, *tarayensis* or *taraiyensis*,

simung, which belong to it, and as *barang*, which does not, takes the name above assigned to it for reasons to be fully explained elsewhere. It is the most widely distributed of the Oriental genera of the sub-family, ranging from Travancore and Sind in Western India as far east as Borneo. Until 1920 it was treated merely as a well-marked species of *Lutra*, and is still sometimes cited as such; but it differs profoundly from at all events all the Old World species of that genus in the structure of the skull and in some external features, notably, as Hodgson long ago pointed out, in having the end of the tail flattened instead of circular in section.¹ With the Clawless Otter (*Amblonyx*) it cannot be confused on account of the difference between them in the structure of the paws, the tail and some well defined characters in the skull and teeth.

The British Museum has a large collection of specimens, one from Sumatra, the country whence the type of *perspicillata* came, and many from the Malay Peninsula, Indo-China, Burma and India, mostly secured in the last two countries by the Bombay Mammal Survey as the familiar names of the collectors indicate. The localities are as follows: Pegu (Oates), West of Toungoo, 500 to 600 ft. and west of Kindat (Mackenzie); the Chin Hills (Shortridge); the 'Triangle', about 26° N. and 98° E., 1,500 and 3,000 ft., in Upper Burma (Kaulback); Sadiya, 500 ft., Golaghat, 250 ft. (Wells), the Chibi River, 1,500 ft. and the Dikhu River in the Naga Hills (Mills). The Burmese and Assamese specimens from these localities, although individually variable from drabby to very deep chocolate brown do not on the evidence seem distinguishable racially from those found further south which I assign to typical *perspicillata*. But skins from scattered localities in India proper, namely from Nepal (Hodgson), Mt. Abu, Rajputana (Impey), Damoh, 1,200 ft. (Crump), Ghazipur (Flower), Madras² (Jerdon), Trivandrum (Ferguson) and the Ankulam Lagoon, Travancore (Pillay) seem to be on the average more rufous or earthy brown than those from Assam and Burma. If further material establishes their racial distinctness, they will take the name *tarayensis* Hodgson, with *macrodus* Gray and *elliotti*, Anderson as synonyms.

There are, however, some additional specimens from the valley of the Lower Indus, mostly collected for the Survey by S. H. Prater which may be regarded as representing a distinct race.

¹ This peculiarity is very manifest on well preserved dried skins in which the terminal part of the tail appears to be keeled on each side.

² Skins and skulls of an adult ♂ and ♀ with this history are the cotypes of *macrodus* Gray which by some strange mistake he described as having come from South America. Perhaps stranger still was the failure to detect that mistake by the authors who subsequently handled the specimens and discussed the status of *macrodus*.

Lutrogale perspicillata sindica subsp. nov.

Locality of the type.—Chak in the Sukkur district of Sind.

Distribution.—The Indus valley at least from Bahawalpur southwards to Sind.

Distinguished on the average from representatives of *L. perspicillata* inhabiting the rest of Hindostan by its noticeably paler colour, in accordance no doubt with the more arid nature of its habitat, the general hue of the upper side being drabby, tawny or sandy brown instead of darker brown with a rusty tinge.

I have seen in all 7 skins of this otter from the Lower Indus. One labelled Sind, another Sukkur, Sind, were sent to the British Museum many years ago from the Karachi Museum. Two were collected by Prater at Sukkur and three at eastern Nara, Khairpur. None of the specimens is quite full grown as the skulls indicate. The Khairpur skins are a trifle darker than those from Sukkur, thus approaching those from other parts of Peninsular India; and a young specimen, about one-third grown, from Bahawalpur (J. Scully), is also darker, not very different from the type of *tarayensis*, Hodgson from the Nepal Tarai. Possibly young specimens of *sindica* are darker than adults.

Both Hume and Blanford who saw at least one example of this otter in Sind, thought it differed from the ordinary Indian form by its smaller size. This supposition is not borne out by the flesh-measurements Prater recorded or by the skulls he secured. His type, a young adult ♀, measured: head and body 25 4/5 in., tail 17 4/5 in.; hind foot 5 1/4 in. Its weight was 16 lb. Hodgson gave the dimensions of the head and body of Nepalese specimens of the Smooth Otter as from 26 to 28 in., the tail 16 in. and the weight from 16 to 20 lb. The largest British Indian specimen I have seen is one of Mackenzie's from west of Kindat, an adult ♂ with the head and body 29 3/5 in., the tail 17 in., the hind foot 5 3/5 in. and the weight 24 lb. Dunbar Brander recorded the weight of a large ♂, which he identified as the Common Otter (*Lutra vulgaris*), from Central India, as 22 lb.

Hume's account, quoted by Blanford, of this Otter being trained in Sind for capturing fish and porpoises was confirmed by Prater who wrote: 'Otters are not uncommon in the Indus and Eastern Nara. They are kept by the Muhanas (fishermen) who employ them as decoys for capturing dolphins (*Platanista gangetica*) and fish. Two or three tame otters are let into the river and food in the shape of fish or prawns is thrown to them, whereupon there ensues a great mewing and splashing, and the commotion attracts the fish which blunder into the nets prepared for them.'

The range of this Otter beyond the lower Indus is unknown. Conceivably it extends into Baluchistan and may indeed be the same as the otter recorded as *Lutra vulgaris* by Pitman who saw the tracks on the Tigris and Euphrates. (*Journ. Bomb. Nat. Hist. Soc.*, xxviii, 1922, reprinted p. 319 in 'A Survey of the Fauna of Iraq' published by the Society, 1923). But this Mesopotamian otter is more likely to be *Lutra lutra seistanica* Birula, which presumably was assigned to its correct genus.

THE GAME FISHES OF INDIA¹

BY

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(With one coloured plate, two black and white plates and
one text-figure).

(Continued from page 285 Vol. xli, No. 2).

IX.—THE MAHSEERS OR THE LARGE-SCALED BARBELS OF INDIA.

2. THE TOR MAHSEER, *Barbus (Tor) tor* (Hamilton).

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INTRODUCTION.

In the preceding article of this series (7)² reference was made to the confusion that prevails in the taxonomy of the large-scaled Barrels of India, popularly and collectively known to anglers as Mahseer, and an attempt was made to define the precise specific limits of Hamilton's (6, p. 303) *Cyprinus (Cyprinus) putitora*, the largest Indian carp. The nomenclature to be adopted for fishes of this type was also discussed, and, very tentatively, their retention in the genus *Barbus* Cuvier and subgenus *Tor* Gray was suggested. Hamilton's second species of the large-scaled Barrels, *Cyprinus (Cyprinus) tor* forms the subject matter of this article.

NOMENCLATURE.

To elucidate further the systematic position of the large-scaled Barrels of India I enquired of Mr. J. R. Norman of the British Museum as to the suitability of using the generic designations

¹ Published with permission of Director, Zoological Survey of India.

² Numerals in thick type within brackets refer to the serial numbers of the various publications listed in the bibliography at the end of the paper.

Barbus Cuvier, *Tor* Gray or *Labeobarbus* Rüppel for these fishes. Dr. E. Trewavas attended to this enquiry and wrote me as follows in her letter of the 25th August, 1939:—

'Your letter to Mr. Norman about the nomenclature of the Mahseer came just as Mr. Norman was about to leave for his holiday. His opinion was that until someone revises the whole *Barbus* complex it is premature to split *Barbus* sensu lato into genera but that the Mahseer is probably at least subgenerically distinct from *Barbus barbus* and that *Tor* can be used provisionally as a subgeneric name, provided it is not antedated by *Labeobarbus*. I have looked up the original use of *Labeobarbus* (van Hasselt 1823, reprinted 1824—I have seen the 1824 reference). It was then used for *L. leptocheilus* and *L. lipocheilus*. It is doubtful whether this was a valid proposition of the genus for those two species, but in any case the name *Labeobarbus* cannot afterwards be used for the Mahseer.'

As I could not find any reference to *Labeobarbus* van Hasselt in Weber and de Beaufort's *Fishes of the Indo-Australian Archipelago* or in Jordan's *Genera of Fishes*, and as *Bull. Sci. Nat.* (Férussac), II, 1824, in which abstracts from van Hasselt's letters on the fishes of Java were published, was not available in India, I requested Prof. L. F. de Beaufort of the Zoologisch Museum, Amsterdam, to further elucidate the status of *Labeobarbus* van Hasselt as used for *L. leptocheilus* and *L. lipocheilus*. He very kindly sent me the following opinion in his letter of the 6th October, 1939:—

'As you know, van Hasselt used to write letters from Java to Temminck and abstracts of these have been published in *Algemeene Kunsten Letterbode*, a periodical of that time. The letters were written in Dutch.'

'Now de Féruccac republished some of these letters in his *Bulletin des Sciences naturelles* and so I find in Vol. II, 1824, p. 374 a translation of a letter, written by van Hasselt on December 29, 1822, and published in the *Alg. Kunsten Letterbode*, 1823, Augustus, No. 35. In this letter van Hasselt says (p. 376 of the *Bull. Sci. Nat.* II):

'Le genre *Labeobarbus* consiste en *Labeones* avec quatre barbillons et une nageoire, dorsale, dont le deuxième rayon n'est pas dentelé; il réunit donc les caractères du *Labeo* et du *Barbus*; c'est pourquoi j'ai formé le mot *Labeobarbus*. Les épithètes *L. leptocheilus* et *lipocheilus* (m), distinguent les deux espèces qu'on trouve dans la rivière auprès de Batavia, et dont j'ai les dessins.'

'*Labeobarbus leptocheilus* has been described by Cuvier and Valenciennes as *Dangila leptocheila* (synon. of *D. cuvieri*) and *L. lipocheilus* as *Chondrostoma lipocheilos* (= *Tylognathus hispidus* C. V.).'

'I hope that *Dangila* has not to give way for *Labeobarbus*, but I fear the worse.'

In the light of the observations made in the above correspondence, I have re-examined the evidence for using *Tor* Gray as a subgenus of *Barbus* Cuvier for the Mahseers of India, and find that the course adopted in my first article of the sub-series is the only one possible under the present circumstances.

The above correspondence makes it abundantly clear that *Labeobarbus* Rüppel (1836) cannot now be used as a generic name for any group of animals and that it is probably not distinct from *Tor* Gray (1833). Further, *Labeobarbus* van Hasselt (1823), which is sufficiently well characterised to satisfy all the requirements of the International Rules of Zoological Nomenclature, replaces *Dangila* Cuvier and Valenciennes (1842).

HISTORY AND DESCRIPTION.

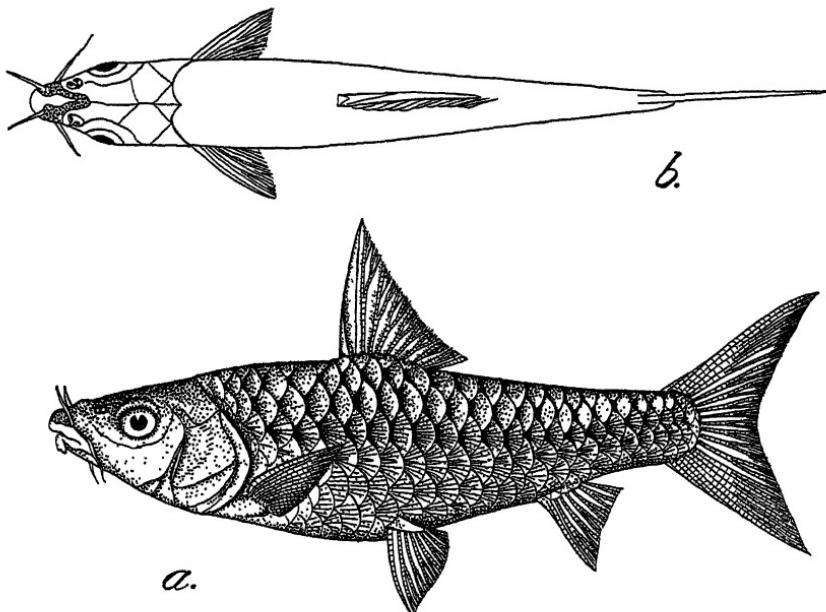
Hamilton (6, p. 388) characterised his *Cyprinus tor* as follows:—

'*Cyprinus verus cirrhis* 4; radii in pinna dorsi 11, quorum 3 priores simplices, in anali 8; squamis maximis; rostro laevi imperforato; labiis integerrimis; pinnis inferioribus rubicundis.

'B 3, D 11, P 18, V 9, A 8, C 19t.'

This species was found by Hamilton in the Mahananda River where it was stated by him to grow to three or four feet in length. According to his notes on the fish and fisheries of Bengal (*vide* Day, 2, pp. 50, 60, 90) Tor Mahseer seems to be more widely distributed than the Putitor Mahseer, for he recorded it from the districts of Rangpur, Purniah, and Behar and Patna. In the list of fishes of the Rangpur District, Hamilton compares it with the Putitor Mahseer as follows:—

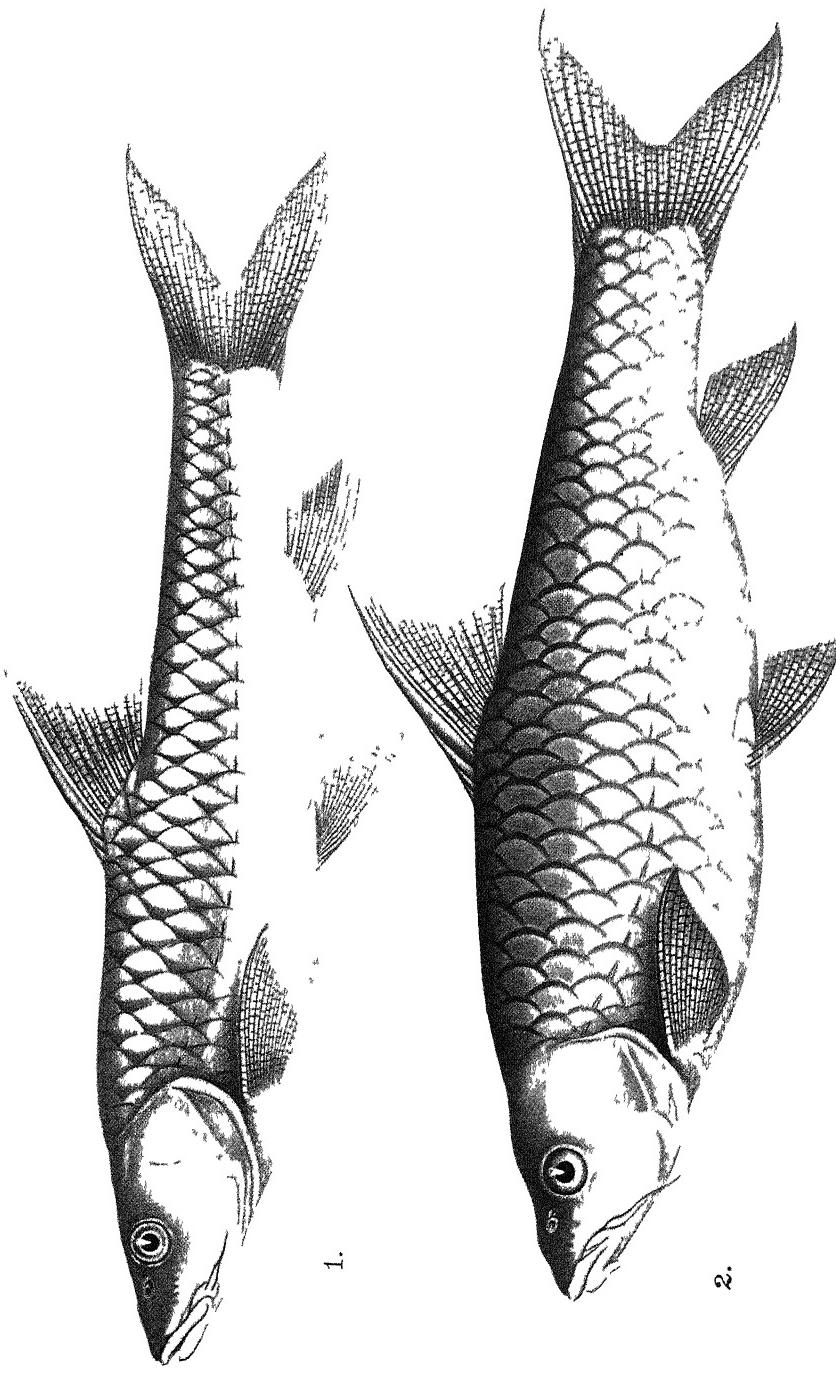
'The *Tor* of the Tista does not grow above two feet in length, but its scales are as large in proportion as those of the last-mentioned fish, and its colours are more splendid, almost equal in beauty to those of the *Rohit*.'



Text-fig. 1.—Copies of Hamilton's original drawings of *Cyprinus* (*Cyprinus*) *tor* (MS. drawing No. 121, vol. iv, A.S.B. Library).

a. Lateral view; b. Outline sketch of dorsal view.

Hamilton mentions that on the Kosi this fish is called *Turiā* or *Sahārā* and on the Son *Kajrā*, and 'is one of the best fresh water



- 1 THE PUTTITOR MAHSEER, Barbus (Tor) putitora (Hamilton),
- 2 THE TOR MAHSEER, Barbus (Tor) tor (Hamilton)

fishes that I have tasted. It grows to fully as large a size as the Rohu.'

Though Hamilton's detailed description is of a very generalised type, fortunately he made a drawing of the species which is now preserved among a collection of his manuscript drawings in the library of the Royal Asiatic Society of Bengal. It was published in colour by Gray (4, vol. ii, pl. xcvi, fig. 1) as *Tor Hamiltonii* without any acknowledgment or letterpress; a copy of the original is reproduced here for ready reference. Though Gunther (5, p. 130) considered this species to be a synonym of *Barbus mosal* (Hamilton) the majority of the later workers followed Day (3, p. 564) and used *Barbus tor* (Hamilton) in a very wide sense to include practically all types of large-scaled Barbels of India. Hora and Mukerji (8, p. 140), as a result of the collections made by them in the Eastern Doons, were able to assign a definite specific limit to Hamilton's *Cyprinus tor*, a form in which the head is considerably shorter than the depth of the body and the lower fins are reddish in colour. From Hamilton's descriptions of *C. putitora* and *C. tor* the following differences may be noted:-

Cyprinus putitora.

1 Grows to 9 feet in length.

2. Oblong compressed form

3 Colour above dusky, with gloss of steel, edges of scales change from gold to silver, lower part silvery, fins without spots, hinder ones tinged with yellow

4 Head blunt, oval.

5 Back forms a sharp ridge Tail suddenly narrowed behind anal fin

6 Pectorals with 15 rays.

Cyprinus tor.

Grows to 3-4 feet in length

Long compressed form, rather more prominent below than above

Colour above shines with gold and green, below like silver, fins without spots but those on belly coloured red, dorsal fin and portion above eyes dotted.

Head sharpish, half-oval (being flattish above); a protuberance between nostrils.

Back has a blunt or convex edge.

Pectorals with 18 rays.

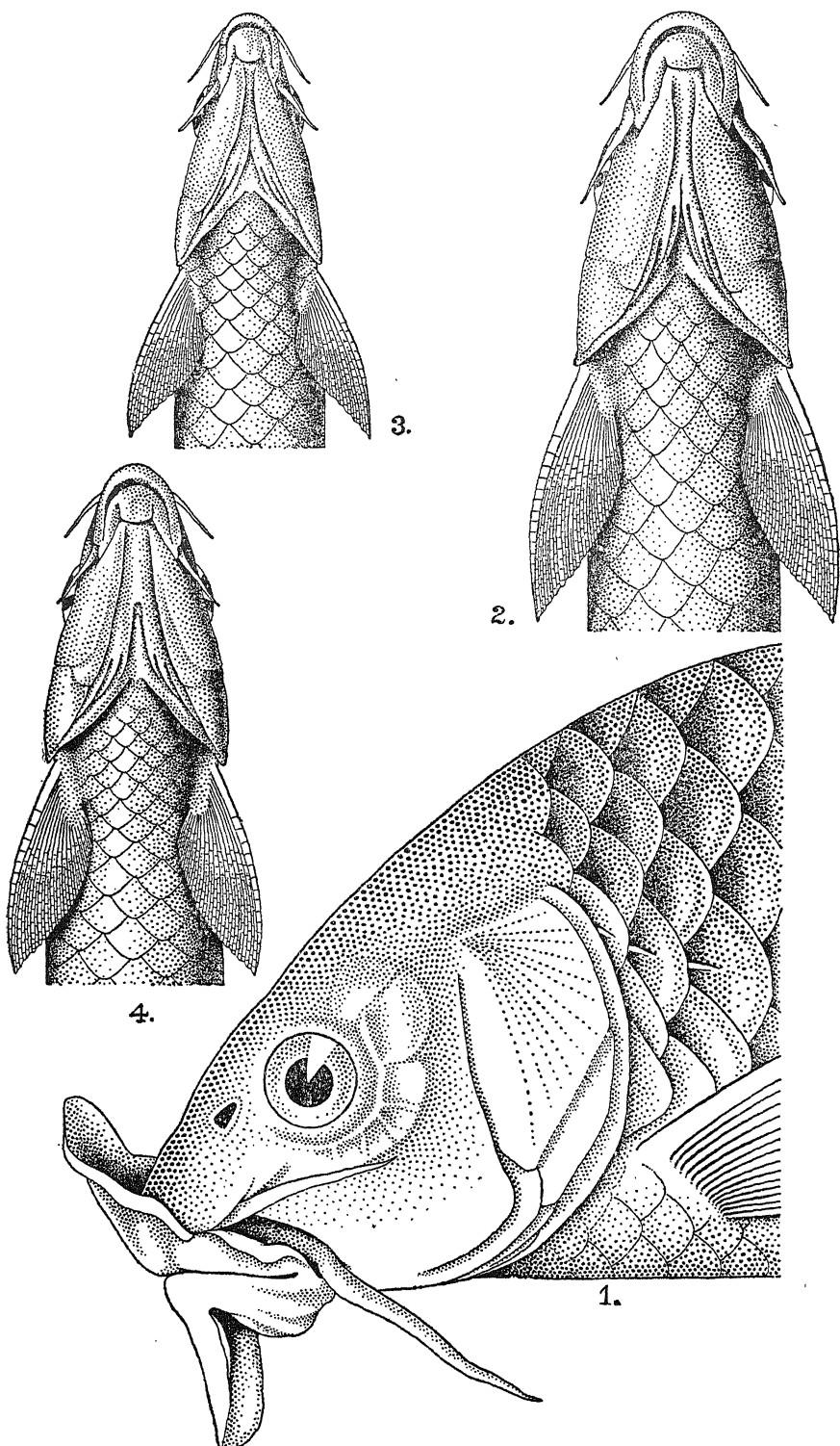
In the coloured plate (Plate I), which accompanies this article, I have given drawings of the young specimens of the Putitor (Plate I, fig. 1) and Tor (Plate I, fig. 2) Mahseers respectively from the Tista River in the Kalimpong Duars in order to clarify the differences between the two forms tabulated above from their original descriptions. It should, however, be remembered that though the colour sketches were made in the field from fresh specimens, the specimens had been out of water for several hours when purchased from the Washabari Bazaar several miles away from the river. Though the Tor Mahseer was originally described from the north-eastern parts of Bengal, it is now known to be widely distributed and is described below from a number of different localities,

Barbus (Tor) tor (Hamilton).

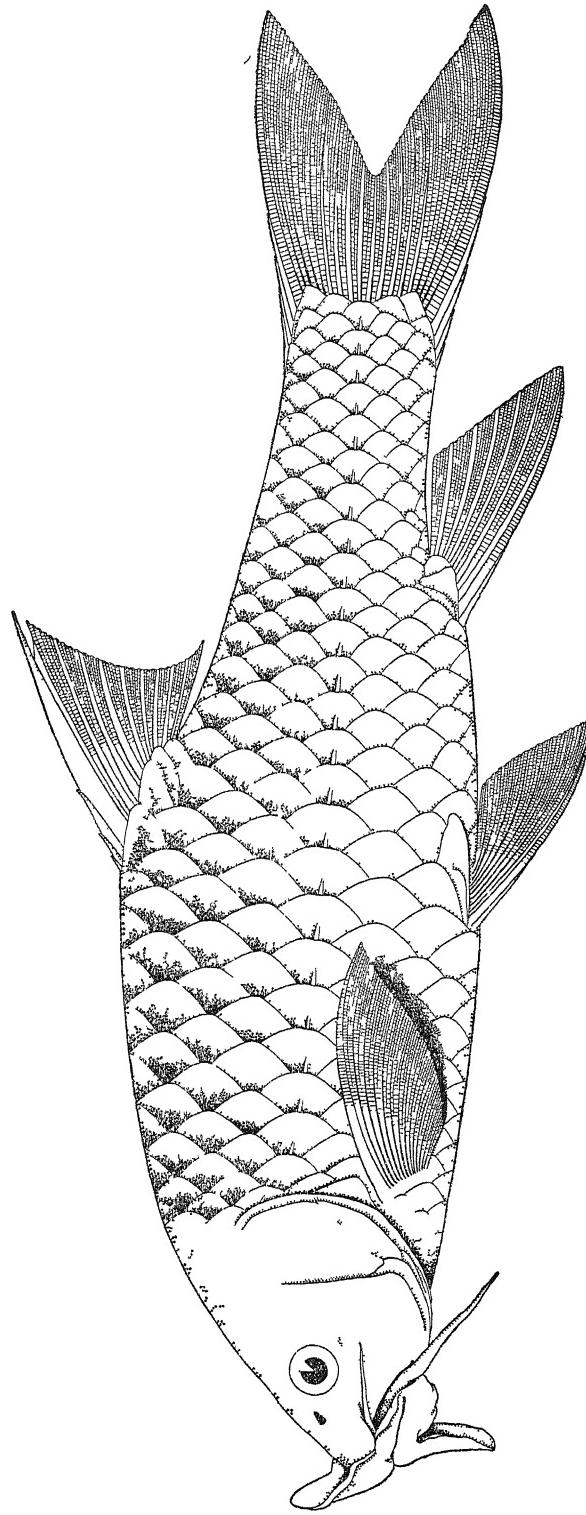
1822. *Cyprinus (Cyprinus) tor*, Hamilton, *Fish. Ganges*, pp. 305, 388.
 1833. *Tor Hamiltoni*, Gray, *Ills. Ind. Zoology*, II, pl. xcvi, fig. 1.
 1919. *Barbus putitora*, Annandale (*nec* Hamilton), *Rec. Ind. Mus.* XVI,
 p. 136, pl. iii, fig. 15.
 1936. *Barbus tor*, Hora & Mukerji, *Rec. Ind. Mus.*, XXXVIII, p. 139.
 1936. *Barbus tor*, Hora, *Rec. Ind. Mus.*, XXXVIII, p. 326, text-figs. 5, 6.
 D. 4/8; 3/5; P. 15-18; V. 9; C. 19†.

The Tor Mahseer is more stoutly built than the Putitor Mahseer and, as pointed out by Hamilton, it is somewhat compressed with the ventral profile more prominently arched than the dorsal. The head is proportionately smaller than that of the Putitor Mahseer and is sharpish anteriorly; with the exception of very young specimens, it is always shorter than the greatest depth of the body. The length of the head is contained in the standard length from 3·4 times in the young specimens to about 4 times in older individuals. The depth of the body is almost equal to the length of the head in young examples up to about 100 mm. in total length but in older specimens the head is invariably shorter than the depth of the body; the length of the head is contained from 1·0 to 1·3 times in the depth of the body. The depth of the body is contained from 3·0 to 3·7 times in the standard length. The eyes are situated nearer to the tip of the snout than to the hind border of the operculum and are provided with circular pupils. The eyes are proportionately larger in smaller individuals; the diameter of the eye is contained from 2·5 to about 4 times in the length of the snout and from 0·7 to 1·8 times in the interorbital distance. The least height of the caudal peduncle is contained from 1·2 to 1·4 times in its length.

The mouth is small; its gape does not extend to below the eyes; it is horizontal with the opening obliquely directed upwards. The lips are fleshy and continuous at the angles of the mouth; the posterior lip is invariably produced into a median lobe and the post-labial groove is continuous. As pointed out in the case of the Putitor Mahseer (7, pp. 279-282), the condition of the lips varies considerably in different specimens irrespective of size. In the Dehra Dun examples, ranging in length up to 270 mm., the lips and the median lobe are poorly or moderately developed (Plate II, figs. 2-4) while in the specimens from the Tista River they are fairly well developed. The greatest development of the lips has been noticed in a specimen 485 mm. in total length, from the Barak River, Assam (Plate II, fig. 1; Plate III), while in the largest specimen examined (Brahmaputra River, Guhauti, Assam) the lips are described by Annandale (1, p. 136) as 'thick and fleshy but not produced forwards; the lower lip is slightly retroverted in the middle line'. There are two pairs of well-developed barbels; the maxillary are slightly longer than the rostral but are shorter than the diameter of the eye. The body is covered with large scales; there are 22 to 27 scales in a longitudinal series along the lateral line and 2½ rows between the lateral line and the base of the pelvic fin. The general lepidosis is not very different from



Types of Lips in *Tor Mahseer*, *Barbus (Tor) tor* (Hamilton).
For explanation see end of article.



Lateral view of specimen of *Barbus (Tor) tor* (Hamilton) from the Barak River, Assam \times ca 2/5

that described for the Putitor Mahseer. There is a well-developed scaly appendage in the axil of each pelvic fin.

The dorsal fin commences opposite to or slightly in advance of the pelvics, and its position in relation to the tip of the snout and the base of the caudal fin varies with the size of the specimen; the last spine is strong and bony, and is invariably shorter than the depth of the body below it. The pectoral fins are low, slightly shorter or longer than the head, and are sharp above. The pelvic fins are also sharp and do not extend to the anal opening. The caudal fin is deeply forked with both the lobes sharply pointed.

Hamilton (6, p. 305) noted that 'Above its colour shines with gold and green, below like silver. The fins have no spots, but the dorsal one is dotted. The eyes are silver coloured with some dots above.' He also noted that the fins on the belly are of a reddish colour. In a small, fresh specimen, about 193 mm. in standard length, collected from the Tista River but purchased at the Washabari Bazaar in the Eastern Duars several hours after its removal from water, the dorsal surface of the body was of a greyish-green colour and that of the head neutral green. The sides of the body in the middle were of a pinkish colour which was replaced above by greenish gold and below by light olive green. The head was variegated with patches of light orange above the gill-opening, of light Indian yellow below the eyes and of light sky blue on the operculum. The lips and barbels were of a light yellowish colour. The dorsal fin was reddish buff while the pectorals, pelvics and anal fins were of deep orange colour. The upper lobe of the dorsal fin was light orange while the lower lobe was of a bluish pink colour. A drawing of this specimen, in original colours, is reproduced here on Plate I as figure 2.

Bionomics :—As a result of their studies on the material collected in the Eastern Doons, Hora and Mukerji (8, p. 141) made the following observations on the feeding habits and the breeding period of the species:—

'*B. tor* is a common food fish and by the local people it is believed to be more powerful than *Mahseer*, *B. putitora*. The intestine is moderately long and convoluted; its length is equal to about 4·5 times the total length of the fish. It feeds preferably on filamentous algae and water plants, but in some cases young Gastropod molluscs, sand and gravel were found among the stomach contents. The young specimens were found to feed on slimy matter encrusting rocks and stones.'

'From the presence of a large number of young specimens in our collection, it would appear that the fish breeds in August-September. The fry is characterised by a black spot before the base of the caudal fin.'

Geographical Distribution :—In the present state of our knowledge, it is not possible to give a precise idea of the geographical distribution of *B. tor*, but probably it is widely distributed along the foot-hills of the Himalayas. I have examined young specimens from the Doon Hills; Saran District, Bihar; Tista River below Darjeeling Himalayas; the Brahmaputra and the Barak rivers in Assam. I have also examined a specimen from Bilaspur in the Central Provinces which agrees fairly closely with the Himalayan specimens of *B. tor* but its fins are considerably smaller and the

MEASUREMENTS IN MILLIMETRES

caudal peduncle is more stumpy. In these respects it corresponds with the Assam example described by Annandale as *B. putitora*, but which in reality belongs to *B. tor*.

ACKNOWLEDGMENTS.

As in the case of the previous articles in this series, the cost of illustrating this article was borne by the Bombay Natural History Society and for this my sincerest thanks are due to the authorities of the Society. I am indebted to Mr. K. S. Misra for preparing the table of measurements. The colour drawings are the work of Babu B. Bagchi, while the text-figures were prepared by Babus B. Bagchi and A. Mondul. I am thankful to them for the skill and care with which they executed the work under my supervision.

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EXPLANATION OF PLATES.

Plate I.

Two types of Mahseers from the Tista River.

Fig. 1.—The Putitor Mahseer, *Barbus (Tor) putitora* Hamilton (*Vide supra* p. 521) $\times \frac{3}{4}$.

For description of colour see the preceding article of this series (7, p. 278).

Fig. 2.—The Tor Mahseer, *Barbus (Tor) tor* (Hamilton) (*Vide supra* pp. 521-523) $\times \frac{3}{4}$.

Plate II.

Types of lips in Tor Mahseer, Barbus (Tor) tor (Hamilton).

Fig. 1.—Lateral view of head and anterior part of body of a specimen, 485 mm. in total length, from the Barak River, Assam, showing greatly hypertrophied lips $\times \frac{4}{5}$.

Figs. 2-4.—Ventral surface of head and anterior part of body of 3 young specimens of *Barbus (Tor) tor* (Hamilton) from the Eastern Dooms, showing stages in the enlargements of the lips and of the median lobe. $\times \frac{1}{3}$.

Plate III.

Lateral view of the specimen of *Barbus (Tor) tor* (Hamilton) from the Barak River, Assam. $\times ca. \frac{2}{5}$.

NOTES ON SOME INDIAN BIRDS.

By

E. H. N. LOWTHER, M.B.O.U., F.Z.S.

(With 6 plates).

IV.—THE MANBHUM DISTRICT.

(Continued from page 424 of Vol. xl). *

At the end of 1932, when I married, I had already made up my mind to give up bird photography as I felt it would not be right to continue taxing my health and strength to the extent which the work involves in the plains. In the beginning of the following February, however, I was unexpectedly posted to Dhanbad, in the Manbhumi District. Here, the graceful slopes of Parasnath, the highest hill in Bihar, with the beautiful forest country round the Topchanchi reservoir at its feet, held out such promises of a rich and varied bird life, that my intentions were quickly forgotten, and I soon found myself keener than ever in the pursuit of my hobby. As a result I can now claim that never before, nor since, have I been so successful with the camera as I was during the three years I was stationed in this district. Let me say at once that during this period I added the photographs of sixty-seven new birds to my collection, a fact which, perhaps, justifies an attempt to describe my camera experiences here, or rather in that part of the district which forms the Dhanbad sub-division.

It is not only on account of its wonderful bird life that the Manbhumi district will always remain green in my memory; it was here too that my wife and I were shown such kindness and received such hospitality on all sides from the mining community as we feel cannot exist elsewhere in India. But this is not all; it was in this district also that I first made the acquaintance of Sakroo Mahato. Aged about thirty, on the small side, but well built and wiry to a degree, he was intelligent above his station and was recommended to me by a friend who had found him to be a big game *shikari* possessing considerable knowledge of bird and insect life as well. Sakroo's boyhood, as I came to know later, was spent looking after cattle and goats, and in those early years he had mastered the art of snaring birds at their nests and learnt not only to distinguish the calls and notes of the different species to be found near his home, but also to imitate them. I have told elsewhere of how, when he first came into my service, Sakroo performed the almost incredible feat of finding twelve Nightjars' nests in one day. Nevertheless, in spite of his knowledge of birds and their nests, Sakroo's ignorance with regard to some of the resident species was amazing. For instance, although

he knew the Rock Horned Owl and could imitate its call to perfection, he had no idea of where to look for its eggs, nor did he know that Crested Swifts were to be found near his home, and he had failed to connect the Pitta with its nest. I could continue quoting such instances but I prefer to remember Sakroo for his virtues, one of which was his aptitude to learn. This, and the other gifts with which he had been blessed by Nature, coupled with the fact that he was working on his own terrain, which he knew as well as the palm of his hand, made me soon realise that in Sakroo I had a *shikari* without peer.

Having praised Sakroo according to his deserts, I am reminded of another *shikari* (Guffara, of Shalabug, near the Anchar Lake), who was in my employ during 1924 and 1931. When the time came for me to return to duty at the end of my first visit to Kashmir, Guffara wanted a *chitty* to enable him to secure employment in the future, and, *sui more*, produced a number of letters given by previous employers, to guide me as to what I was expected to say of him. These were kept carefully in the cover of an old novel given him by a 'Captain Sahib' who must have possessed a delightful sense of humour as the title of the novel was *All Men are Liars*. But it is high time I returned to my mutinies and said something concerning the district.

The Manbhum district is frequently referred to in the *New Fauna* and elsewhere as being in Bengal whereas in fact it forms the eastern part of the Chota Nagpur division in Bihar and lies between $22^{\circ} 43'$ and $24^{\circ} 4'$ North Latitude and $85^{\circ} 49'$ and $86^{\circ} 54'$ East Latitude. It contains an area of 4,147 square miles and is bounded on the north by the districts of Hazaribagh and the Sonthal Parganas; on the east by Burdwan, Bankura and Midnapore—all part of Bengal; on the south by Singhbhum, and on the west by Ranchi and Hazaribagh. Purulia is the administrative head-quarters, but the district is divided into two parts, Dhanbad being the head-quarters of the sub-division with an area of 803 square miles.

The country generally is flat, with a gradual fall in an easterly direction. On the north-west is a range of hills, some of considerable height, with the south-eastern slopes of Parasnath (4,480 feet) just inside the district. With the exception of a fair amount of rice cultivation there are no agricultural activities, the majority of inhabitants being occupied in mining coal, in the output of which mineral the Jharia field, situated in the district, is far and away the largest in India.

Except along the Grand Trunk road, and in the vicinity of the hills in the north-west of the district, trees are comparatively few in number, and the only jungle that exists is also to be found on these same hills. The commonest tree, and one which is plentiful, is the Flame of the Forest or *palas*. Others frequently met with are the mango, *pipal*, *mhowa*, *simal* and *jamun*, and on the hill sides, bamboo.

All the rivers have an easterly or south-easterly course, and as is usual with hill-fed streams, their beds are almost entirely

dry during the greater part of the cold season, and throughout the hot weather. They are not navigable and are subject to sudden and violent freshets which are usually of short duration. The principal rivers are the Barakar, which marks the whole of the northern boundary, and the Damodar, which, roughly speaking, divides the district into two parts, and which, with the Barakar, also divides the district from Burdwan.

Several tanks overgrown with weeds exist, but with the exception of the Jharia Water Board's reservoir at Topchanchi, there is no water of any expanse; consequently any species of duck is a *rara avis*, though snipe are fairly plentiful in the paddy fields during the winter months. Cattle and Little Egrets abound, while most ponds with any vegetation round their edges are tenanted by at least one pair of Dabchicks, Moorhens and Bronze-winged Jacanas. Round the Topchanchi reservoir an occasional Grey and Purple Heron, and more rarely a Black Ibis, may be seen, but where they breed I never found out. The Night Heron, Little Cormorant and Whiskered Tern breed locally in colonies, but, speaking generally, the district is not popular with water-fowl or waders.

Considering the limited area suitable to their existence, game birds, if not common, are nevertheless not poorly represented. Red Jungle-fowl, Painted Spur-fowl and Peafowl occur in small numbers, but only in the vicinity of the well-wooded hills. Because of persecution both by the gun-license holder and the Sonthal, all three species are intensely shy and difficult to approach and seldom come out into the open except to drink, towards dusk. In this connection I ought to mention that the colliery manager is a very keen *shikari*, and many spend all Sunday in quest of what they may obtain, frequently motoring out fifty or more miles *pour la chasse*. The Sonthal is an even mightier hunter, and being a deadly shot with bow and arrow, and carrying these at all times, whether in the field or jungle, is greatly responsible for the small number of game birds found. In suitable country, Grey Partridge are to be seen, and more frequently heard, but the Black Partridge I came across only occasionally, and then always near the Jamuni river. The Jungle Bush-Quail occurs locally but the Common Indian Bustard-Quail is fairly numerous in cultivation and scrub. The Common Sand Grouse and Painted Partridge I never saw though I have shot both (each once only) in the neighbouring district of Hazaribagh, fifteen miles distant from Parasnath. The Stone-Plover is somewhat scarce, a remark which also applies to the Yellow-wattled Lapwing, but the Green Pigeon plentiful. I never saw the Emerald Dove, and the Purple Wood-Pigeon but once.

The scrub jungle harbours a wealth of bird-life—Common and Franklin's Nightjars, Ioras, Thick-billed and Tickell's Flower-peckers; Yellow-eyed and Jungle Babblers, White-eyes, Little Minivets and Common Wood-Shrikes, to mention only the most common species. Wherever *palas* and *mhowa* trees occur, and even about habitations, Brahminy Mynahs, Bay-backed Shrikes, Large Cuckoo-Shrikes and Jerdon's Chloropsis are common, while



A GREEN BEE EATER AT THE ENTRANCE OF ITS NEST

The tail is spread fanwise for support

a *simal* tree, as often as not, provides a nesting site for a pair of Indian Orioles or Large Pairakeets. Here too are found the Sirkeer and a number of other species of cuckoo. It will not be out of place to remark now that *Cuculus c. canorus* arrives in this and the neighbouring districts of Chota Nagpur about the middle of April and is resident for nearly two months; that the notes—*wuck-wuck-wuckoo*, or *wuckoo-wuckoo*—of the Indian Cuckoo may also be heard throughout April and May. In spite of the most diligent searching, neither I nor my *shikaris* came across an egg which could possibly be attributed to either of these species, nor were they ever noted on the return passage. Can it be that the return migration is made by a different route?

Near the edge of heavier jungle, but outside it, the Green Barbet is found, and inside, the Common Pitta, Orange-headed Ground-Thrush, Spotted Babbler and Shama. Such jungle occurs on all the medium sized hills rising to 2,000 feet. *Nalas*, festooned with various kinds of creepers, are here frequent and provide ideal nesting-sites for three species of Flycatchers, as also an occasional Large Green-billed Malkoha. In the forest-clearings, and the bamboo jungle, I always expected to find the Large Racket-tailed Drongo but never once saw the bird. I am confident this species does not occur on Parasnath or the neighbouring hills, or in the Tundi range, as Sakroo did not know it when I showed him *Dissemurus p. grandis* in the forest at the foot of Jumra *pahar* in the Hazaribagh district, not fifty miles distant. Elsewhere throughout the Chota Nagpur division the species is common. But once again I seem to have missed my cue as I did not set out to tell of the different birds which one might expect to see in the Manbhum district but to describe some of my camera experiences there.

Uninteresting though it may sound, the first bird whose photograph I added to my collection in this district was the Green Bee-Eater. Numbers dig their tunnels in the low perpendicular banks beside the Grand Trunk Road down to which the paddy fields often run. Other favourite nesting sites are in the sandy banks of the valley streams, now dry in April and May. Digging operations were already considerably advanced with the pair I had under observation, sufficiently so for the birds to be right out of sight while at work. Even so it was noticeable that although only one bird at a time usually devoted itself to tunnelling, it sometimes happened that male and female were inside the passage together, when it seemed that while the one was engaged in excavating, the other employed itself in throwing out the loose earth. After working for a few minutes, always they left the tunnel together. Later, on 30 April, when the male and female Bee-Eaters were repeatedly observed flying in and out of their nest-hole with food—usually grasshoppers—in their bills, arrangements were made to photograph them at home. During the three succeeding evenings I discovered that only one bird remained overnight in the nesting tunnel, the other using the leafy twig of a mango tree hard by on which to sleep.

So gradually was the *hide* introduced that the Green Bee-Eaters paid it no attention. Successful photography was, however, an almost impossible matter owing to the way in which the birds flew straight into the tunnel without first alighting at its mouth. The result was that the exposures made the first morning merely showed a blur of movement. Accordingly, the next session saw me resort to strategy. If I hissed as the Bee-Eater was on the point of entering the tunnel, perhaps the bird would alight for a second at its mouth and give me the opportunity I wanted. The plan worked better than I dared hope, and during the next fifteen minutes I obtained two successful pictures, one a profile and the other a back view, with the head partly in the tunnel. The fan-like spread of the tail will be noted, and the manner in which the long median feathers are pressed against the bank face.

Writing of the Green Bee-Eater calls to mind the curious and tragic accidents which sometimes befall birds. While out for a walk one morning I noticed a Green Bee-Eater sally forth from its perch in pursuit of some insect. The chase led the bird round a *babool* tree and then in my direction. The next moment a grasshopper settled just where I was going to put my foot. A split-second later, the Bee-Eater, hot in pursuit, alighted at the same spot, and although my foot came down on it ever so lightly—indeed the step was never completed and the grasshopper uninjured—the little bird was killed. I suppose it was so bent on obtaining a meal—perhaps to feed its young—that it failed to realise my presence. As my *shikari*, who saw everything, remarked:—‘*Sahib, you might walk a crore of kos and such an accident not occur again.*’

The Blue-tailed Bee-Eater occurs very rarely in the district—I only found its nest once, in the sandy bank of a stream—and the only other representative of the genus which I came across in these parts was the rare and handsome Blue-bearded Bee-Eater. Essentially a forest bird, this species was only met with round the Topchanchi reservoir. I am confident it breeds in the jungle here as it was heard calling every spring and up to the end of August, although it was not until 1935 that the bird was definitely seen and recognised. I was at the time photographing a Dabchick near her nest on a small piece of water between the road encircling the reservoir and the main jungle leading up to Parasnath when the unidentified call reached my ears, and looking through the *hide* spotted the author perched high up in a *simal* tree. From time to time it flew to the trunk of a dead tree where it appeared to find food in plenty. The method of calling, and the call itself, are very correctly described in the *New Fauna*¹. The call is a deep hoarse double croak ending in a chuckle—*kok-kok-keeaou-kek-kek-kek*. At the outset it is uttered with the head held low and the long blue feathers of the throat puffed out; with each succeeding



A MALE PARADISE FLYCATCHER AT NEST.
It has not yet acquired the white plumage of the fully adult male.

note the head is raised higher and higher, until finally the bird has the appearance of a crowing cock.

It is a waste of time looking for nests of the different species of Flycatchers that breed here until just before the monsoon breaks, but from about the middle of June all four—the Indian Paradise, the White-spotted Fantail, the Black-naped and Tickell's Blue Flycatchers—are busy with household duties. The second named, in these hills, as apparently also throughout the hilly regions of the Central Provinces, replaces the White-browed Fantail so commonly found in the plains of northern India. In Manbhum this last is a decidedly rare bird as I only came across it once. The Paradise and the White-spotted Fantail occur in considerable numbers, the latter frequently building its home but three or four feet from the ground, considerably lower than does the White-browed Fantail elsewhere. The Black-naped Flycatcher, a blue bird with black forehead, black top-not, and a crescent marking of similar colour on its breast, although by no means so common as the other species, cannot but be classed as occurring frequently. Tickell's Blue Flycatcher, with pinky-orange coloured breast, is only less numerous than the Paradise and White-spotted Fantail Flycatchers, but differs from the other three species in its choice of nesting quarters. The compact little nest, with skeleton leaves frequently serving as basis, is built either in a hole of a bank or more commonly of a stump of a tree or bush. All four species are a joy to watch and their quite pleasing songs may be heard by every intruder of their haunts, although, with the exception of the White-spotted Fantail, all are somewhat shy birds.

With the Paradise Flycatcher nesting so generally it was only natural that I should devote particular attention to the breeding plumage of the male bird. The male breeds even in the chestnut phase though mating must be most unusual until after his second moult when his lovely white plumage is acquired. Only once did I come across a male, with a nest, wearing the same plumage as the female. My observations showed too that although the male Paradise Flycatcher shares in the tasks of incubating the eggs and feeding the young he apparently takes no part in constructing the nest. This was also found to be the case with the Himalayan sub-species.

Blue is a most unsatisfactory colour so far as photography is concerned, and owing to the amount of blue in the plumage of the Black-naped and Tickell's Blue Flycatchers, one obtains from a print an entirely erroneous idea of the prevailing hue of these two species. Fortunately black, as a rule, is correctly rendered, so that the black markings of the Black-naped Flycatcher show up clearly in photographs. Otherwise there is nothing of particular interest to record with regard to the photography of the different Flycatchers. The fastest plates should be used as their nests are generally found in jungle where, more often than not, lighting conditions are poor; in the case of the Spotted Fantail, the employment of a large stop is usually necessary as the bird is never still for the fraction of a second.

Writing of the Black-naped Flycatcher, I am reminded of an incident which occurred when photographing this species at the nest. The nest was built on a small creeper growing over a *nala* about eight feet wide, and, after I had finished camera operations, I retired a little distance to observe more clearly the behaviour of the birds when feeding their young. While seated in the *nala*, a heavy thunder storm came on and for a space of twenty minutes or more it simply poured. Presently I heard an extraordinary sort of roar, the noise becoming louder and approaching nearer every second. I could not make out what it was. It could not have been a train as a hill nearly 2,000 feet high, and three miles of country, intervened between myself and the railway line, and it certainly was not an earthquake nor any animal with which I was familiar. However, my anxiety was soon rested when a freshet bore down on us like a baby tank. Where a few minutes before the *nala* was as dry as a bone, water three feet deep now hurled itself headlong in its haste to join some larger stream below. Pondering over the phenomenon I thought how terrifying an experience it must be to be caught by a large river in spate, or a tidal bore.

Just as when first we went to school the 'Bloods' in the xv were (and still are) in our imagination the finest 'Rugger' players we ever saw, so too perusal of the three volumes of Hume's *Nests and Eggs* even to this day conjures up visions of a wonderful team of ornithologists: Blewitt, Aitken, Brooks (also of the East Indian Railway), Scrope Doig and Major Cock, to mention only a few of Hume's great correspondents. Sandwiched in amongst these giants of a past era, working quietly and therefore liable to escape notice, but all the time using his weight, like a good forward in the 'scrum', we find occasional reference to a Captain Beavan and his discoveries in Manbhum. Was he in the Ramgarh Battalion stationed at Hazaribagh, and did he spend the hot weather on the top of Parasnath? Or was he a 'Soldier-Political' administrating the recently subdued district of the Sonthal Parganas? Who or what he was, I have never been able to learn. Memories in the East are but short-lived and I would commend to the Editors of the *Journal* the necessity for publishing, before the facts are lost in oblivion, a Bibliography or 'Who's Who' of Indian Ornithologists.

This dip into the past is occasioned by a glance through the notes detailing my finding and photographing the nests of the Tickell's and Thick-billed Flowerpeckers and Captain Beavan's records on their nidification in *Nests and Eggs*. With regard to the former Hume remarks:—'The late Captain Beavan, so far as I know, was the first person certainly to take the nest of Tickell's Flowerpecker', and from the description of the nest of the Thick-billed Flowerpecker by Captain Beavan one obtains the impression that to him falls the honour of first finding the nest of this species also.¹ Whether this was the case or not, both species still occur commonly in the Manbhum district although their nests are amongst

¹ Vol. ii, pp. 274, 277 and 278.

the hardest I know of to discover. Inspite of the statement made by Stuart Baker in the *New Fauna* where, writing of the nest of Tickell's Flowerpecker, he remarks :—'In appearance and construction it is exactly like that of the other Flowerpeckers',¹ this is not the case; at all events it is unlike the Thick-billed Flowerpecker's, the only other Flowerpecker with whose nesting I have acquaintance. The nest of Tickell's Flowerpecker is *suspended from a twig* and is not unlike that of the Purple Sunbird, minus however the 'porch' over the entrance, and without the 'trailer' so common to the nest of *Leptocoma a. asiatica*, but that of the Thick-billed Flowerpecker is a bag-shaped structure, *with the roof slung along the under-side of a twig*. The materials employed in the construction of the two nests are also entirely different. Fine grass stems and a cotton-like down go largely to the making of Tickell's Flowerpecker's nest, the exterior being covered with cobwebs, cocoons, small species of bark and shavings of rotten wood, whereas the nest of the Thick-billed Flowerpecker is made mainly from the down of the *palas* flower, with spiders egg-casings worked in between, so that the whole has the appearance of being woven into one piece of felt, reddish-brown in colour.

Most nests will be found in March or early April; numbers are destroyed by the gales prevalent at this time of year. In my experience the Thick-billed Flowerpecker lays but two eggs, of a pinky-white ground colour, with reddish-brown spots, while Tickell's Flowerpecker lays three more usually than two eggs—white and unspotted. Both select the same situations for nesting purposes, generally a twig of a mango or *seesum* tree, the nest being built at any height from ten to twenty-five or more feet from the ground. I too can bear testimony to what has been stated by several observers, that the nest of the Thick-billed Flowerpecker is often situated in the midst of the leaf-nests of that vicious creature, the large red ant; in fact I would go further and say that this is almost invariably the case.

The nest at which I photographed Tickell's Flowerpecker contained three young ones almost ready to fly. This was on 22 April and the little home was clearly feeling the strain of the extra weight, added to which a strong westerly wind rocked it as it willed. The call of the parents as we erected the *hide* was an excellent imitation of a cricket's reel, and the alarm note a sharp, piercing *utic, utic*. Neither bird showed any fear and fed the young every two or three minutes. Nevertheless photographic work was almost out of the question owing to a gale which sprang up and constantly put the nest out of focus, and the very quick movements of the birds themselves. The food given to the young was a small pill, pinkish-red in colour, probably the berry of *Loranthus longiflorus*, the mistletoe-like plant so generally parasitic on *sal* and *mhowa* trees in these parts.

Every third time they were fed one of the young always turned round and poked its vent out of the entrance, the parent either

¹ Vol. iii, p. 433.

alighting on the nest to remove the excreta, or hovering with quick-beating wings and flying off with the sack as it was expelled, sometimes even helping in its expulsion, helping in the sense that the sack was seized before it had finally left the vent.

I never succeeded in finding a nest of the Quaker Babbler but twice came across the bird on the lower slopes of Parasnath in April. Other babblers occur as residents, and, as soon as the rains break, many nests of the Spotted Babbler are to be found just inside the jungle surrounding the Jharia Water Board's reservoir. They are always built on gently-sloping ground which, at this season, is covered with a deep carpet of leaves. The nest itself is a globular ball of dead leaves, about the size of a fairly large melon, and usually is scantily lined with the fine stems of the maidenhair fern. Three eggs form the full clutch. The bird is shy and a great skulker but has a most attractive call, a clear whistle, *wheat-ee-er*, and a loud note, *chunk-chunk-chunk*, which give away its whereabouts. Going down hill it is a simple matter to tread on the nest but if one works the ground in an upward direction the nest is easily seen owing to the bulge it makes in the general contour, and because the entrance always looks down hill. I am afraid many eggs of this species are eaten by snakes which abound in these parts. Here the Spotted Babbler breeds most commonly at an elevation of only 950 feet. It is not a difficult bird to photograph, the only interesting feature about the one I portrayed being that it was minus the outside toe of the left foot.

Discussion of the Spotted Babbler reminds me of the difficulty Sakroo and I always had in talking of the different species: he had no names for most birds and it was useless telling him the English names. We therefore invented names. The Spotted Babbler came to be known as *patti chiriyā*, the 'Leaf bird', in allusion to its nest. Similarly the Orange-headed Ground-Thrush was referred to as *chupki*, the 'Silent one', the Sirkeer as *neoru chiriyā*, from its resemblance to a mongoose when running along the ground, and so on through the gamut; which is a better method of each understanding the other than the one my devoted first *shikari*, Pokhi, tried to adopt. He was with me in Kashmir in 1931 when we met Lala Sheikh, Mr. B. B. Osmaston's old *shikari*. Lala was well acquainted with the English names of birds and aired his knowledge at every turn. This was too much for Pokhi who determined that in future he would always speak of a bird by its English name. Alas! the first one he tried his hand on, or rather his tongue, was Hume's Willow-Warbler. I explained who Hume was and he repeated the name a dozen times till he thought he had it pat—but his rendering of it, '*Hume sahib que Willow-Babbler*', brought a smile to my face and Pokhi thereafter decided our made-up names were good enough for him.

The Rufous-bellied Babbler is quite as common a breeding species in these parts as the Spotted Babbler, but to my mind the former's nest is far more difficult to find; in its breeding habits too the species is interesting from more than one point of view. To begin with, the nests are of two different types,



THE SPOTTED BABBLER

The nest is a globular ball of dead leaves

either an oval ball of dead bamboo leaves lying on its side, with the entrance at the end, or more commonly a ball of coarse grass with the entrance about half way up the side. Whatever the material employed, the nest is usually situated only a few inches from the ground, although I once saw one about four feet up in a bush, and another quite six feet—both unusually high. The nest may be built either among grass and weeds surrounding a small bush on the outskirts of jungle, or a little way in the jungle, but all those I have seen had this common feature, they were always built alongside a path of sorts. Many have no lining but others a slight one of what appears to be hairs but which close inspection reveals to be fine maidenhair fern stems. Then again, the breeding season is prolonged and commences a fortnight or more before that of the Spotted Babbler, and continues till the middle of September, as I see from my notes that both in 1934 and the following year I examined nests containing young on the 12th of that month. Four is the largest number of eggs I have seen in a nest. These have a white ground with the slightest shade of red, with reddish-brown spots and blotches.

The Rufous-bellied Babbler, like the Spotted Babbler, is a great skulker, but if one remains motionless in its haunts, the bird may be studied at ease. Once I observed a pair, apparently males, fighting. They were seated on a horizontal twig, facing each other. One put its head down, uttered a challenging note, threw its head up and advanced a step towards the other. His opponent went through exactly the same performance, and both repeated it until finally they met, flying at each other—a confused mass of feathers—and eventually separated. This was on 30 June and possibly the birds were disputing territory. On another occasion I watched a party of quite twelve Rufous-bellied Babblers rummaging under a mass of dead leaves. At times none of them were to be seen, though the leaves showed movement. Had I first come across them feeding in this manner, invisible, it is quite probable I would have imagined the movements of the leaves were caused by a snake and have hit out with my *khud* stick. The party spirit is most noticeable in this small species which is well termed Rufous-bellied. The male (who is the more brightly coloured) possesses quite a pleasant song of which I wrote in the following terms while listening to it—"The first half very like a red-winged bush-lark's, and the latter part resembling the canary-like notes of the sunbird, the two running into each other without a break".

I never came across the Large Grey Babbler in Manbhumi. Other babblers which occur in the district are the Jungle, the Common, and Yellow-eyed Babbler, the first and last named being found in considerable numbers but the Common Babbler less generally. Of the Yellow-eyed Babbler it can truthfully be said that there is nothing about the bird which does not at once please; the ruddy-chestnut upper plumage, long tail and chaste lower parts, the blood-orange eyelids, its acrobatic ways as it climbs up or down some reed stem, the sweet song, beautiful nest and lovely eggs, all combine to make the Yellow-eyed Babbler a most attractive

bird to meet. A week or so after the monsoon breaks, as soon as the scrub jungle affords better concealment, one can confidently look for its nest and continue to do so till August and even early September. Five eggs are usually laid, pinky-white in ground colour, thickly marked all over with chestnut-red; more rarely they are sparingly but boldly marked with the same colouring.

The Green and Blossom-headed Parrakeets commence nesting operations early in the year and their eggs may be found regularly from about the beginning of February till the end of March or even later. The Green Parrakeet usually makes use of a natural hole in a tree for nesting purposes, or one previously occupied by a woodpecker or barbet. It rarely cuts one out itself, whereas the Blossom-headed species almost invariably cuts out its own hole. The former favours holes in mango trees; the latter is partial to the *mhowa*, its nest hole generally being cut in the large 'knots' about the size of a man's head, which are a feature of this tree. The Large Indian Parrakeet starts to nest even earlier—or is it later?—and its eggs may be found fairly regularly throughout December. The earliest record I have of this species is 20 November when I examined a nest containing three eggs. This is the usual number in a clutch although I have occasionally found four. The Green Parrakeet normally lays four, and the Blossom-headed species commonly five eggs. The Large Alexandrine Parrakeet differs from the others in that it almost invariably nests in natural holes of the red silk cotton tree, and always at great heights from the ground. The word nest is really a misnomer when applied to the *Psittaci* as the eggs of all of the genus are laid on the bare floor of the hole made or selected, no attempt being made at furnishing. In these parts I never came across a nest in a hole of a building or wall, though elsewhere in northern India such sites are regularly used by *Psittacula krameri manillensis*.

All three species have fallen victims to my camera but there is little in the behaviour of one to distinguish it from the others when at the nest. Both sexes incubate and feed the young, though in the case of the Large Indian Parrakeet these tasks devolve more largely on the female. All feed their young by regurgitation, but while *P. eupatria nepalensis* and *P. c. cyanocephala* approach the nesting tree quietly and usually at long intervals, the Green Parrakeet seems to feed the young more frequently and often gives notice of its coming. The food given by all three species must I think, usually be the fruit of the wild fig, judging by the visits of the birds to such trees. There can be little doubt that the small berries inside the unripe *mhowa* flower also form a considerable item on the menu.

What a gorgeous sight the *mhowa* presents at this season with its fresh green foliage; the deep mauve coloured flowers of the orchid so commonly parasitical on this tree also add greatly to the joy. How over-powering though the smell of the fruit!

The small woodpecker common in the Manbhumi district is the Yellow-fronted Pied species, *mahrattensis*. The Golden-backed



THE BLACK-BACKED WOODPECKER
Outside its collar-shaped nest hole

Woodpecker is decidedly scarce, its place being taken by the Black-backed Woodpecker, a somewhat larger and equally handsome species. This frequents the outer fringes of mixed jungle and is found particularly about the lower slopes of small hills. For a nesting tree the *simal* is a great favourite, and often the same tree is resorted to year after year, a flesh hole only being cut higher up the trunk and a little to the side of the previous one. This is not circular in form as is usual with the *Picidae* but somewhat horse-collar shaped. The species is an early breeder and the egg may be found from about 10 January onwards, or even earlier, as on the 25th of that month in 1934 a nest I examined contained a young one whose wing feathers were already beginning to grow. Altogether six nests came under my inspection and not in one instance did these contain more than a single egg or young one.

The different text books tell us that the Rufous Woodpecker occurs generally in Chota Nagpur. Accordingly I hoped to meet the species in the district and looked forward keenly to studying this very interesting bird at its equally interesting nest, constructed inside the *papier-mâché*-like blackish-grey nest of a tree ant, with which it seems to live on the most friendly terms. Alas! I never came across either the bird or its nest in Manbhum or elsewhere in the Chota Nagpur division.

A number of small ravines, heavily forested, mainly with bamboo growth, run down from the hills to the Topchanchi reservoir on all sides except the north-east, and afford sufficient cover for possibly half a dozen pairs of Shammas. I was enthralled when I listened early one morning to the lovely notes of this fine songster. I had never before heard them, and although I felt sure the Shama was the author, my curiosity was not to be satisfied that morning, nor was it until some days later that I actually saw the accomplished artist perform. Now I wanted to find its nest, and, if possible, to photograph the bird at home, though the prospect of doing so seemed hopeless, such a forest and shade-loving species is the Shama. To cut matters short, I wasted two seasons looking in the wrong sort of place for the nest. Whatever the Shama may do elsewhere, in the Manbhum district it builds its nest *only* in holes of trees or stumps, not more than five or six feet from the ground, and never, I think, amongst the collection of dead leaves found at the foot of every clump of bamboos. The nest is rather an untidy affair, with a basis (sometimes quite substantial) of dead leaves, and has a lining of fine roots. Here the bird does not begin to nest until after the rains have set in, the earliest (and first) note I have of a nest being 25 June when I found one containing five fresh eggs. It is more usual to find nests with eggs at the beginning of July. The breeding season is short and the young have flown by the middle of August at the latest. Five is an unusual clutch and my experience coincides with that stated in *Nidification of Birds*, that four is the normal number of eggs laid.¹ These are

¹ Vol. ii, p. 106.

much the same in size as those of the Magpie-Robin, to which, of course, the Shama is closely related. There is also in the colour and markings of the eggs of the two species a close family resemblance, those of the Shama, however, possessing more of a green than a blue ground. Like the Spotted Babbler and the Orange-headed Ground-Thrush, the Shama nests usually at an elevation of only 950 feet. Higher than 1,000 feet I never found its nest.

There is no difficulty in photographing the Shama at the nest as it is very confiding, but owing to the very poor lighting conditions that invariably exist at the nest, I wasted nearly fifty plates before I obtained a picture that bears reproduction at all. The female is clad in sombre plumage but the male handsomely clothed; nevertheless he is just as difficult to pick up in the jungle as is his mate.

The Iora breeds commonly in the scrub jungle proper, and where scattered *palas* and *sal* trees occur, the Little Minivet, Large Cuckoo-Shrike, Jerdon's Chloropsis, the Sirkeer, and Spotted Dove. The Common Pitta occasionally nests in similar country but more usually it breeds in mixed deciduous forest. By making its beautiful nest so generally in low bushes,—often in close proximity to the Yellow-eyed Babbler—the Iora earns the photographer's everlasting gratitude.

Reading through my notes written when photographing the Iora, I am reminded of a matter not generally realised, how young birds quickly succumb from even a comparatively short exposure to the sun's fierce rays, exactly as they do if deprived of the parent's warmth and protection when it rains heavily. Although both sexes incubate and feed the young most assiduously, I noticed the female Iora only, during the first five days of their lives, brooding her young for about ten minutes every third time she fed them, her wings out-stretched, to shield them from our old friend—and enemy too, in the East—*Sol*. Clearly she was aware of the sun's danger to the young. I have noticed the same anxiety shown by the Painted Stork, King Crow and a female Chestnut Bittern.

The Little Minivet is most partial to the *palas* tree for nesting purposes. The nest harmonises closely with its surroundings and looks just like a knot in a branch. It would usually escape detection but for the parents flying to and from a particular tree, obviously to feed the young, or taking material to build their charming little home. What a handsome creature is the male with his beautiful grey upper plumage, flame-coloured rump and breast, his long tail and a wing-patch similarly coloured, and his bluish-grey chin and throat! The female, with her yellow plumage, and generally paler colouring than her consort's, is a 'good-looker' as well. At one nest which I 'worked', the female always flew away with the white sack-like excreta of the young held in her bill; the male, on the other hand, almost invariably ate this while still near the nest.



JERDON'S CHLOROPSIS (Male).
The cobweb covered nest is suspended between the stems of two leaves.

Jerdon's *Chloropsis*, or the Malabar Green-winged Chloropsis, as Mr. Stuart Baker would now have us call this delightful bird, is exceedingly common in Manbhum, even frequenting gardens in Dhanbad itself, where owing to its powers of mimicry, it frequently deceived me into thinking a shikra had paid me a visit. More usually it is met with in the scrub, and about *palas* and *mhowa* trees round hamlets near the jungle. Its cheerful notes take some learning, and owing to its bright green colouring it is not a species which can easily be detected while perched in a tree. Nevertheless, though few colliery managers know Jerdon's *Chloropsis* by sight, there is not a local savage who is not well acquainted with the *hara* (green) *bulbul*, as the bird is usually called. About seven inches in length, the sexes are alike in general colouring, but whereas the male has a purple chin and a streak of the same colour from the eye to the base of the throat, the female has these parts greenish-blue. Like others of its genus, Jerdon's *Chloropsis* is entirely arboreal in its habits. The nesting season is prolonged. I have found nests containing eggs in March and again in the early part of September, and in every month in between. The nest, a fairly deep cup, is constructed of very fine roots, covered on the outside with cobwebs and vegetable fibres, and suspended hammock-like between the stems of two leaves. It is always placed at the extreme end of a *palas* bough, and usually at a height of between 20' and 30' from the ground. I must have examined quite forty nests and not in one single instance were they other than as described. Two is the full number of eggs in a clutch.

One other representative of this genus is found in Manbhum but is uncommon—the Gold-fronted *Chloropsis*. In the thicker scrub and mixed jungle of the Dolkata *nala* leading up to Parasnath, I once came across a nest of this species early in July containing two eggs.

One of the noisiest birds I know of—I do not include the Jungle Babbler which is in a class by itself—is the Large Indian Cuckoo-Shrike. Always as it utters its loud shrieking call I feel that the bird has been given a sharp and unexpected nip or pinch by some exuberant neighbour! Keeping much to the tops of *mhowa* and *num* trees bordering on cultivated land, and to *simal*, *gharnim* and *sal* trees where the scrub jungle adjoins deciduous forest, this Cuckoo-Shrike continually utters its loud parrakeet-like call. About the size of a dove, this species is mostly grey in colour, darker on the upper than the lower parts, which are almost white, and closely barred about the breast. The nest too is generally built in these same trees, but whereas in the United Provinces the few I found were quite substantial saucer-shaped structures, in Manbhum they were invariably flimsily built affairs, always placed on some horizontal branch where it forked. The nest is decidedly small for the size of the bird, about five inches in width at the outside, and a little over an inch in depth. I have no note of a nest containing more than two eggs or young. The egg is a yellowish-buff in ground colour and is well blotched with

chocolate-brown markings distributed evenly over the surface. The breeding season commences about the third week in March and continues till the middle of July.

The photograph of the Large Cuckoo-Shrike rather gives the impression that the young have come to the end of their tether and will soon pass out. In a sense this was the case but was caused, not by prolonged exposure owing to the parents being afraid to return to the nest, but by the young having a surfeit of a mixed caterpillar diet! A charming feature about this species when courting is the manner in which it lifts and shakes each wing alternately over the back, calling as it does so.

From about the beginning of March till the end of September the Indian Oriole occurs commonly throughout the district. It is partial to gardens and mango *topes*. The Black-headed Oriole, however, which is resident throughout the year and, comparatively speaking, scarce, is far shyer and spends its life in more remote regions, on the forest's edge and even inside the jungle. Yet, since a bird will always refute you if it can, I have known *O. xanthornus* also build its nest in a garden! Both species possess the most delightful liquid calls, as also a horrid rasping note; both build nests identical in every respect, placed between slender horizontal twigs at the end of a branch, usually between 20' and 30' from the ground. The Black-headed Oriole however, sometimes makes its nest quite low down when this is built in jungle, not more than eight or ten feet from the ground. A description of the nest here is unnecessary as not only is it familiar to most people but elsewhere it has been so well described. The number of eggs in a nest varies from two to three in the case of the Black-headed Oriole and between two and four where *Oriolus o. kundoo* is concerned, though in Kashmir I once found a nest containing five eggs.

Neither Oriole is easy to approach with the camera and unless the *machan* is very gradually built and its construction spread over a period of a week or longer, the chances are the birds will desert the nest. The young, at first, are fed on gnats and other minute insects, and later, on small caterpillars, and in early infancy are the blondest things imaginable.

Thick scrub jungle, interspersed with much *palas* and *sal* growth, is a feature of the country side in the hilly parts of the Manbhumi district. Here it is that the Sirkeer-Cuckoo is often enough to be found, though few people I know were aware of the bird's occurrence until they had spent a day with me shooting Jungle-Fowl. More than once, when the beat was over, I was asked 'What was the brown-looking bird with a long tail and red and yellow bill which came out a few minutes ago, perched on a *sal*, and then sneaked off?' I am sure my interrogator's credulity was taxed to the utmost when I told him it is a species of cuckoo and that it builds a nest instead of laying its eggs in the nests of other birds, as is the case with the 'Haubinger of Spring' at home, and my *bête noir* out here, the Koel.



A LARGE INDIAN CUCKOO SHRIKE

A surfeit of caterpillars explains the grievous depression of the chicks.

In spite of the Sirkeer occurring fairly commonly I have found few nests myself, though I have seen many others, thanks to the agency of Sakroo. Nearly all those I have examined were built in the uppermost branches of pollarded *pals* and *sal* trees, where the dense foliage made detection difficult. The nest is a fairly substantial platform of twigs, with a lining of green leaves, usually of the tree in which the nest is built. The eggs, which are two or three in number, are pure white when first laid and average 1.40 inches in length by 1.05 inches in breadth. In the Manbhumi district the breeding season extends from the end of April till the end of September, on the 29th of which month I have seen a nest containing three well incubated eggs.

I have tried very hard to photograph the Sirkeer at the nest but have never come anywhere near success, and in view of my experiences have long since abandoned all efforts in this direction. The bird will at once desert if the nest contains eggs. I regret to say such has also been the case when there have been young, this in spite of my having superintended personally the erection of the *machan* and being satisfied that more than ordinary precautions were taken not to disturb the birds.

The Sirkeer is normally very silent, but, when alarmed, utters a guttural *khokh-khokh*, quickly repeated.

As long ago as 1862, Jerdon either stated the Large Himalayan Green-billed Malkoha occurs or breeds in Chota Nagpur and the Northern Circars, or he thought it did—I am not sure which, as my copy of 'Jerdon' was lent a few years ago to a friend who failed to return it. But no ornithologist since appears to have met with this species in these parts, judging by what Blanford's *Fauna*, the *New Fauna* and *Nidification of Birds* have to say in the matter. The first named quotes Jerdon in support of the Large Green-billed Malkoha occurring in Chota Nagpur, but adds:—'This needs confirmation',¹ while in the *New Fauna* Mr. Stuart Baker observes—'possibly Chota Nagpur and Northern Circars (Jerdon)',² a statement which is repeated in *Nidification of Birds*, the relevant volume of which was published in 1934.³ It would therefore appear that in spite of the passage of seventy-seven years Jerdon's remarks still await confirmation today (1939). Jerdon was, however, quite correct. It is surprising that the species has not been noted from Chota Nagpur in recent years, as it is not only fairly common (for an unusual bird) in Manbhumi, in the heavy mixed forest round the Topchanchi reservoir and the Dolkata *nala*, but is found in the neighbouring district of Hazaribagh. It is, however, a particularly shy species and frequents forests the European seldom invades, which fact probably accounts for it having remained unnoticed so long. A hasty glimpse of the bird—and this is all that is vouch-safed one as a rule—gives the impression of a very large male koel—it is about twenty-three inches in length, more than half of which is accounted for by the tail. At close quarters,

¹ Vol. iii, p. 232.

² Vol. iv, p. 178

³ Vol. iii, p. 361.

however, the apple-green bill, with a tinge of red about the base, and the bare crimson orbital patch, as also the ashy-green colouring about the head, neck and chin, are noticeable. Sceptics may imagine I am mistaken in my identity and that what I saw was the Small Green-billed Malkoha. Such is not the case. Although I have not come across *Rhopodytes viridirostris*, it is not possible to confuse the two species. The Small Malkoha is not only considerably smaller (about $15\frac{1}{2}$ " in length) but has the orbital patch cobalt-blue and the throat feathers forked, which is not the case with *Rhopodytes t. tristis*.

In the Manbhumi district the Large Green-billed Malkoha nests during July and August in heavy jungle, amongst creepers, at a height of between 15' and 20' from the ground. I have found eggs as early as 14 July and as late as 8 August. The nest is made of twigs and roots and is lined with green leaves, but is not such a substantial structure as that of the Sirkeer which, however, it closely resembles. The three nests I found each contained three eggs. These are a chalky-white in colour and average 1.46×1.05 inches in size.

Although so shy when not breeding the Large Green-billed Malkoha sits closely once incubation has commenced. On several occasions, when I climbed on to the *machan* to photograph this bird, the Malkoha remained on the nest though I was on a level with and in full sight of the bird and but ten feet away. It was only when Sakroo or Pokhi came up as well, to pack me up, that the bird's courage failed. Always as she flew, she uttered a note very similar to that of the Sirkeer.

When I started photographing the Large Green-billed Malkoha on 29 July, an atmospheric depression seemed to have settled over the land and though I took a number of photos on three different days, the weather continued dull till eventually the deluge came, and with it floods, fever and misery for everybody. With the elements conspiring against me and the nesting site being in such a dark place, the resultant negatives are very thin, and it is only due to heavy intensification that a print is possible at all. Nevertheless, I value the Malkoha photographs more highly than many of my more successful efforts with other birds. Of course, when the rain subsided the sun came out in all his glory, but, alas ! the Malkoha's eggs had disappeared and my *machan* been pulled down. I learnt subsequently this was done under instructions from a sub-overseer, whom I had recently reported for permitting promiscuous poaching and fishing, and cutting of grass and timber, his idea being that if he spoilt my nests I would not patronise those parts and he and his satellites would then be able to pursue their nefarious activities unchecked.

In these parts the White-breasted Kingfisher breeds commonly in the sides of *nals* running through the scrub jungle, towards the base of the lower hills, though it also resorts for the same purpose to the banks of small streams running through open country. Nesting tunnels are frequent too where the hill sides have been cut away to make the road running round the Topchanchi

reservoir. I looked forward to finding the rare and abnormal type of nest resembling 'a large, untidy edition of an English Wren's place of abode' first recorded many years ago by Stuart Baker and referred to in *Nests and Eggs*¹, but never happened on one, though I have heard of similar nests of this kingfisher being seen in the Jamalpur hills, in the Monghyr district. The nesting season is prolonged, from April till September, but most nests will be found in June and July. This species, as is well known, is more given to feeding on insects than on fish. The pair I photographed near their nest frequently brought grasshoppers wherewith to feed the young, including a large species almost the size of a locust, which occurs commonly on the thick-leaved mauve and white flowered *Calotropis* plant said to possess medicinal properties. Dragon-flies were also occasionally brought, and on an average of once in every twelve visits, a small fish. The 'shivering' scream of this species as it sits on some tree is a familiar sound. Occasionally the bird indulges in 'stunts'. I once watched *Halcyon smyrnensis fusca* mount high into the skies, flying over the forest in increasingly wider circles till it was almost out of sight, screaming all the while, and then dive obliquely over a distance of a quarter of a mile or more in the direction of an open river. While diving the bird was absolutely silent. This was on 7 May.

The Common Indian Kingfisher occurs far less usually than does the preceding species, but the Pied Kingfisher is common, its nesting operations commencing early in January. The Brown-headed Stork-billed Kingfisher is decidedly scarce. I came across only two nests of this species, in successive years, one containing three fresh eggs and the other four young. The contents of both nests were taken by Manjis before I could attempt photography. The former was found on 31 May and the nest containing young on 10 July.

I was surprised to meet the Orange-headed Ground-Thrush in the district. It occurs only as a summer visitor and is intensely local in its distribution, being confined to one particular area round the Topchanchi reservoir where, however, quite a dozen pairs breed every year. Nesting commences with the advent of the monsoon and is completed by the middle of August, as is the case with the Shama. Normally a silent species, the male possesses a pleasing song heard usually in the early morning. Though reputed to mimic the calls of other species I never heard him attempt this. I have, however, heard the alarm note which has very aptly been likened to the screeching noise produced by a pencil on a slate, but unless one sees the bird one would never connect this note with the Orange-headed Ground-Thrush, so quickly and stealthily does the bird make itself scarce when its haunts are invaded. The male is most handsome, with his bluish-grey upper parts and orange-chestnut head, neck and lower parts; the female is a dull *replica* of the male.

This Ground-Thrush, like many of the other species dealt with here, is a forest-loving bird, and spends its life in jungle where there is plenty of undergrowth, under which it seeks industriously for what it may find to eat, whether vegetable or animal. The nest, which does not appear to be placed higher than 10' from the ground and is built either in a bush, or more usually in the fork of a tree, is not unlike a small edition of a blackbird's nest at Home. It is made of grass stalks and coarse grass, some moss, and lined with maidenhair fern stems and roots, with a fair amount of mud worked into the foundations in some cases but entirely lacking at other times. Both sexes help in building the nest and incubating the eggs, which usually number four; once only I found as many as five. These are very handsome and have a bluish-green ground with (usually) heavy brown-yellowish-red splotches and freckles spread over the entire surface.

A shy species, the Orange-headed Ground-Thrush nevertheless does not object to a hiding tent being introduced near its nest. Though a ready sitter, the bird is an unsatisfactory subject from the photographer's point of view owing to its colour responding poorly even to a panchromatic plate.

Pea-to-yew, a loud, clear and far-reaching note which I had not heard previously, repeated again and again. So close was the bird and obviously calling from a point of vantage; yet it was some considerable time before I spotted the performer. The trouble was I was looking too near. When finally the Zeiss Delactis glasses revealed the bird, perched high up in a *simal* tree, near the trunk, I was struck by the method of calling: head and shoulders thrown right back, chest out, and the bill pointing to the skies, just as a cock crows. This is the normal manner of calling though the bird also occasionally calls from the ground. Having recently acquired the album of *Common Indian Birds* published by the Bombay Natural History Society, depicting a number of species in colour, I had no difficulty in at once identifying the cock-crowing author. It was the Common Indian Pitta, surely one of the most beautiful birds found in the Peninsula. Whistler's description cannot be improved upon. He says:—‘Length 7 inches, sexes alike. Top of head pale fulvous, with a broad black band down the centre which is joined by a very broad black band from below the eye; a narrow white line over the eye; back and shoulders green; lower rump shining pale blue; tail black, tipped with dull blue; wing black with a conspicuous white patch in the flight-feathers, and with the coverts green and blue; chin and throat white; remainder of lower plumage fulvous, a patch of bright scarlet under the tail.’¹ No wonder the Indian knows the Pitta as *nao-ranghi*, the ‘Nine-coloured one’. Like the Orange-headed Ground-Thrush, this species is only a hot weather visitor to these parts; all have left the Chota Nagpur division by the middle of September. Nevertheless, during its stay the Pitta occurs

¹ *Popular Handbook of Indian Birds*, 2nd edition, p. 241.

commonly and it is amusing to watch the bird when it is apprehensive of everything not being quite as it should: the short tail is then flitted up and down after the manner of a moorhen.

Whistler, probably from thinking of others of the genus at the time, has fallen into the error of stating that the majority of nests of the Common Indian Pitta are placed on the ground or in low branches close to it.¹ This is most emphatically not the case. All the nests I have seen—quite fifty in number—were built in trees, close to the trunk, at heights varying from 12' to 25' from the ground. The nest, shaped rather like a rugby football lying on its side, often has the top one-third end sliced off, so that the bird has a *chubutra* or platform from which to approach the nest proper. Four, five and even six eggs are laid, very spherical in shape and measuring approximately 1.00 x .86 inches. These have a lovely china-white ground colour sparingly marked with purple spots and speckles. At times the nest is built in the most exposed of situations, giving the impression that it is a broken-down structure which has yet stood the acid test—storms, wind and the *loo*. More usually it is fairly well concealed in *palas* and *sal* trees, occupying much the same situation as the Sirkeer's nest. It is made of sticks and twigs, with leaves worked in between, is domed, with the entrance at one side, and lined with roots and dead leaves. The breeding season extends from the end of May to the end of July.

Somebody once asked me if I knew the 'Ginger-beer' bird: obviously this species, and an excellent rendering of the Pitta's call.

Not even the most imaginative writer could describe the Pitta as interesting when at the nest. It usually dashes straight in to feed the young, which done it stands on the *chubutra* for minutes at a stretch, looking as though it did not quite know what it had done or was now expected to do. This is not surprising really when it is added that mole-crickets are a favourite dish on the *menu*, a great delicacy which if used with a snare will inevitably bring about a bird's capture. To provide such a *pièce de résistance* all the time to their young must be a sore trial even to fond parents!

I cannot conclude this article without making mention of a great discovery by my wife, in Dhanbad itself, of the breeding of a bird concerning which I hope at some future date to write more fully. I refer to the Whiskered Tern. My wife had been playing golf early one morning and when she burst in on me while I was still shaving it was clear that she had something important to tell. My thoughts at once turned to *birdies* and *eagles*, but it was nothing so prosaic she wished to discuss. She had seen some birds which looked like small gulls, fly with grass or weeds in their bills and then alight on the Baker *bund*, a fair-sized tank less than a quarter of a mile distant from our bungalow, and on the road to the club. It did not take me long to investigate matters for myself. Many of the Whiskered Terns were still building; others

¹ Popular Handbook of Indian Birds, 2nd edition, p. 242.

were on eggs. The nests were in the middle of the *bund*, where the water was deepest, and all on a narrow path of weeds which stretched across from north to south. Later, I counted sixty-three occupied nests here. My enquiries showed that the Whiskered Tern had never previously nested on this piece of water, nor did it do so again during 1934, 1935, 1936 or 1937, this inspite of the fact that, almost without exception, each pair successfully reared and took away its young. At first I was at a loss to explain this but on examining the position more carefully the reason was at once apparent. The narrow strip of weeds which formed the foundation for the nests in 1933 had been cut down at the roots, so that no suitable nesting sites existed. Later, during the same year, I found three more nesting colonies of this species in the district, all approximating in size to the original one discovered by my wife.

Early in 1935 Mr. Prater wrote telling me that Manbhumi is a very important district ornithologically, that many original descriptions were made of birds collected in this area, but that a modern collection of birds from the district was necessary to clear up many points : would I undertake this work? I was unable to do so for several reasons but I believe it will be obvious to anyone who has had the patience to read through this article that Manbhumi is indeed fortunate in the wealth and variety of its bird-life, particularly when it is remembered that this is really confined to a very limited part of the district. The *avisfauna*, however, needs protection and I would urge everybody interested in the subject, everybody who has any authority locally, whether on the District Board, the Jharia Water Board, or Societies for the Protection of Wild Life in the province, to do all in their power to make the country around the Topchanchi reservoir a bird sanctuary. It lends itself to being easily adapted as such. Many will at once rise up and tell me that this is already the case. My reply is 'Don't you believe it. *Expero crede'*—not that I am expert at anything but I do claim that I know better than others what goes on daily round this reservoir and its catchment area.

In order to give a better idea of the ornithological possibilities of the district, I quote below a list of the different species whose nests I found in Manbhumi; I am confident it is capable of many additions.

Jungle Crow, House Crow, Indian Tree Pie, Jungle Babbler, Common Babbler, Rufous-bellied Babbler, Yellow-eyed Babbler, Spotted Babbler, Common Iora, Jerdon's Chloropsis, Gold-fronted Chloropsis, Red-vented Bulbul, Brown-backed Robin, Magpie-Robin, Shama, Orange-headed Ground-Thrush, Tickell's Blue Flycatcher, Paradise Flycatcher, Black-naped Flycatcher, White-spotted Fantail Flycatcher, Bay-backed Shrike, Common Wood-Shrike, Little Minivet, Large Cuckoo-Shrike, King Crow, White-bellied Drongo, Tailor-bird, Streaked Fantail-Warbler, Ashy Wren-Warbler, Indian Wren-Warbler, Jungle Wren-Warbler, Indian Oriole, Black-headed Oriole, Brahminy Mynah, Common Mynah, Pied Mynah, Baya Weaver-Bird, White-throated Munia, White-backed Munia, Spotted Munia, Yellow-throated Sparrow, House-Sparrow, Wire-tailed Swallow, Red-rumped Swallow, Large Pied Wagtail, Indian

Pipit, Red-winged Bush-Lark, Ashy-crowned Finch-Lark, White Eye, Purple Sunbird, Tickell's Flowerpecker, Thick-billed Flower-pecker, Common Indian Pitta, Black-backed Woodpecker, Mahratta Pied Woodpecker, Golden-backed Woodpecker, Crimson-breasted Barbet, Green Barbet, Indian Roller, Green Bee-Eater, Blue-tailed Bee-eater, Pied Kingfisher, Common Small Kingfisher, Brown-headed Stork-billed Kingfisher, White-breasted Kingfisher, Northern Grey Hornbill, Hoopoe, Indian Swift, Palm Swift, Indian Crested Swift, Common Indian Nightjar, Jungle Nightjar, Franklin's Nightjar, Long-tailed Nightjar, Pied Crested Cuckoo (in Jungle Babbler's nest), Koel (in House Crow's nest), Sirkeer, Large Green-billed Malkoha, Crow-Pheasant, Large Indian Parrakeet, Green Parrakeet, Blossom-headed Parrakeet, Rock Horned Owl, Collared Scops Owl, Spotted Owlet, Jungle Owlet, King Vulture, White-backed Vulture, Small Scavenger Vulture, Bonelli's Eagle, Lesser Spotted Eagle, Brahminy Kite, Common Kite, Shikra, Lugger Falcon, Common Green Pigeon, Rufous Turtle-Dove, Spotted Dove, Little Brown-Dove, Indian Ring Dove, Red Turtle-Dove, Common Peafowl, Red Jungle-Fowl, Painted Spur-Fowl, Jungle Bush-Quail, Black Partridge, Grey Partridge, Common Bustard Quail, White-breasted Waterhen, Moorhen, Stone-Plover, Bronze-winged Jacana, Pheasant-tailed Jacana, Red-wattled Lapwing, Yellow-wattled Lapwing, Whiskered Tern, Little Cormorant, White-necked Stork, Little Egret, Cattle Egret, Pond-Heron, Night Heron, Chestnut Bittern, Little Grebe. Total 124 species.

SOME COMMON INDIAN HERBS WITH NOTES ON
THEIR ANATOMICAL CHARACTERS.

BY

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(*With three plates*).

(Continued from page 323 of this volume).

III.—ANDROGRAPHIS ECHIOIDES Nees.

(ACANTHACEAE).

SYNONYMY AND SYSTEMATIC DESCRIPTION.

Andrographis echiooides Nees in Wall. Pl. As. Rar. iii, 117; DC. Prodr. xi, 518; H. F. B. I., iv, 505; Cooke. Fl. Bomb. Pres., Vol. ii, Pt. II, 374; Dalz. & Gibbs. Bomb. Fl., 198; Trim. Fl. Ceyl., Vol. iii, 327. Syn:—*Justicia echiooides* Linn.; Burm. Fl. Ind., 9; Roxb. Fl. Ind., i, 118; Grah. Cat., 164.

An erect herb, average height about 12 in., densely clothed with white hairs; stem quadrangular, grooved. Leaves sessile, decussate, entire, oblong, margins ciliated, base cuneate. Flowers in axillary racemes about as long as the leaves. Calyx glandular-hairy, divided almost to the base, sepals linear, ciliated, elongating in fruit. Corolla pink or white, densely pubescent, 2-lipped, lower lip 3-lobed, blotched with purple. Anthers much exserted, white-bearded; pollen-grains blackish and oblong when dry, and pale-yellow and spherical when moistened. Capsule hairy, elliptic-lanceolate, acute at both ends, compressed. Seeds rugose, glabrous, not compressed.

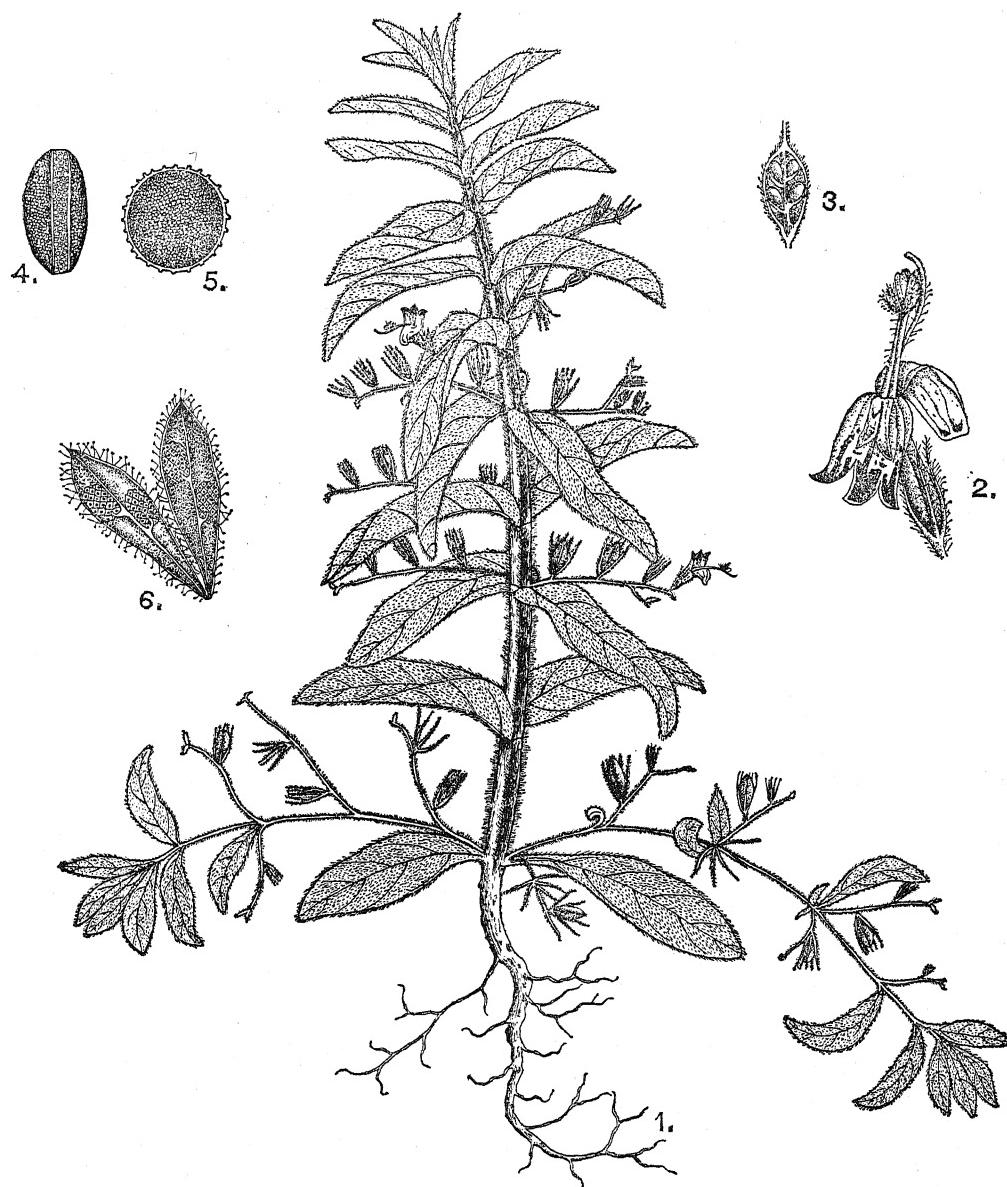
Flowers :—August—October. Medicinal (Kirtikar, 4) (Pl. I & Pl. II, Fig. 1).

INDIAN NAMES.

Ran Chimani (Deccani); Peetumba (Malay).

HABITAT.

Common in the drier districts from the Punjab and Chota Nagpur to Ceylon; absent from Bengal proper and humid Malabar; not very common in Bombay Presidency (Dalzell and Gibson, 2),



Sayeedud-Din—Common Indian Herbs.
Andrographis echiodoides Nees. ($\times \frac{1}{2}$)

For explanation see end of article.

common in the Madras Presidency (Mayuranathan, 5); very common in Hyderabad Deccan (Sayeedud-Din, 6).

ANATOMICAL NOTES.

Structure of the leaf (Plate II, Fig. 2 and Plate III, Fig. 1). The leaf-structure is bifacial. Stomata occur on both sides of the leaf, but are more numerous on the lower. They are of the Caryophyllaceous type, the pairs of guard-cells being accompanied by two subsidiary cells, which are placed transversely to the pore.

Oxalate of lime is present in the form of small prismatic crystals. In the leaf it is found in all parts of the mesophyll and also in the epidermis. In the stem it is present mostly in the pith and the primary cortex.

Besides the occurrence of oxalate of lime, cystoliths are present in the epidermis of the leaf, and a few in that of the herbaceous stem (Plate II, Fig. 2 and Plate III, Fig. 1). They occur singly and are elongated with more or less blunt extremities, although a few are pointed at one end. Solereder (7) mentions that round cystoliths occur in the Andrographideae, and in rare cases transitions to elongated forms with blunt extremities are found.

The hairy covering (Plate III, Figs. 2—7) consists of ordinary clothing hairs and glandular hairs. The clothing hairs are unicellular or uniseriate. Glandular hairs are of two kinds. Those occurring on the stem and leaves are in surface view disc-shaped, and composed of four or more cells separated by vertical walls. The glandular hairs on the calyx and corolla consist of a uniseriate stalk terminating in a glandular spherical head.

Structure of the Stem. Stem and branches are quadrangular in section. Stomata are present. Epidermal cells are rather large. There is no hypodermis. The primary cortex contains collenchymatous cells. An endodermis is present.

CONCLUSIONS.

The study of this plant reveals the following main features which are generally characteristic of the family Acanthaceae. (1) Caryophylloous type of stomata; (2) excretion of oxalate of lime in the form of prismatic crystals; (3) occurrence of elongated cystoliths with blunt extremities (this does not apply to all the members of this family, for there are some genera in which cystoliths are not present, and there are others in which round cystoliths occur); (4) The clothing hairs are unicellular or uniseriate; (5) The glandular hairs on the vegetative portions are disc-shaped and multicellular with vertical walls. Those on the floral parts consist of a long uniseriate stalk terminating in a spherical head.

Besides other features the occurrence of typical cystoliths (with the exception of those members which do not possess these structures) distinguishes Acanthaceae from the allied families Verbenaceae and Labiatae. The shape of cystoliths and their place of occurrence in the leaf can be employed in detailed classification within the family Acanthaceae.

ACKNOWLEDGMENTS.

I am thankful to Mr. Sri Ram Loo for the photographs and the drawings which were prepared under my supervision, and to Messrs. Fateh Nasib Khan and Riazul-Hasan Qureshi for the preparation of several slides.

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EXPLANATION OF PLATES I TO III.

Illustrating M. Sayeedud-Din's paper on 'Some Common Indian Herbs with notes on their Anatomical Characters'.

III. *Andrographis echinoides* Nees.

PLATE I.

- Fig. 1.—Black and white sketch of *Andrographis echinoides* Nees. ($\times \frac{1}{2}$).
 Fig. 2.—A single flower with corolla opened out to show the bearded anthers. ($\times 5$).
 Fig. 3.—L. S. Ovary. ($\times 5$).
 Fig. 4.—Pollen grain, showing the shape in dry condition. ($\times 240$).
 Fig. 5.—Pollen grain, showing the shape in moist condition. ($\times 240$).
 Fig. 6.—Fruit split open to show the rugose seeds. ($\times 5$).

PLATE II.

- Fig. 1.—Photograph of *Andrographis echinoides* Nees.
 Fig. 2.—Photo-micrograph of leaf-epidermis, showing elongated cystoliths and a glandular hair. ($\times 96$).

PLATE III.

- Fig. 1.—Leaf-epidermis, showing cystoliths, stomata and a glandular hair. ($\times 480$).
 Figs. 2 & 3.—Glandular hairs on the vegetative parts in T. S. ($\times 480$).
 Figs. 4 & 5.—Clothing hairs on stem and leaves. ($\times 480$).
 Fig. 6.—Clothing hair on the floral parts. ($\times 480$).
 Fig. 7.—Elongated glandular hair on calyx and corolla. ($\times 96$).



Fig. 1.

Sayeedud-Din—Common Indian Herbs

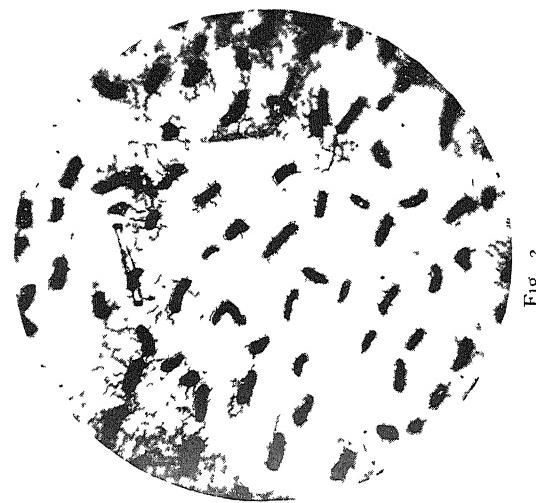
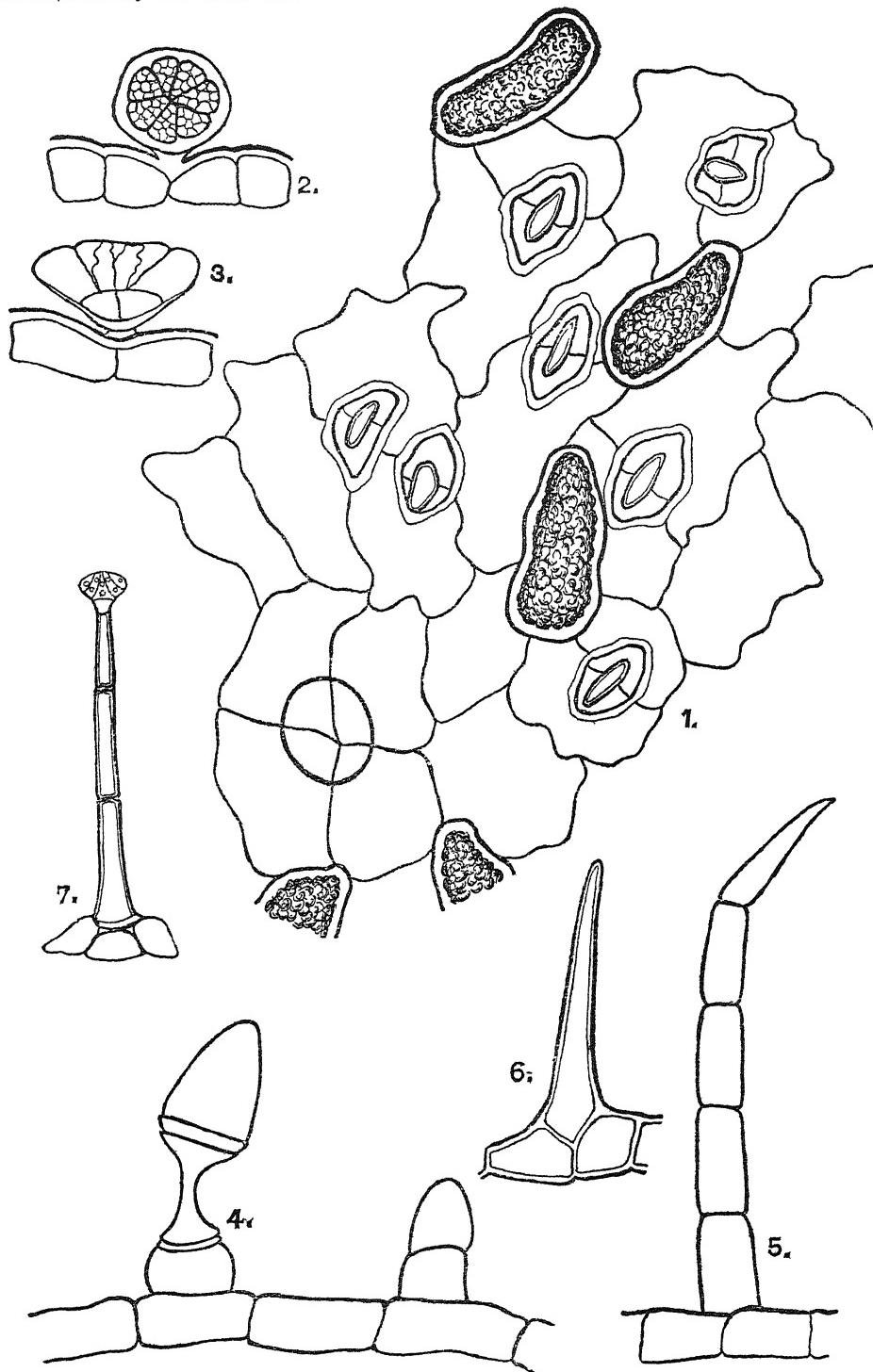


Fig. 2

For explanation see end of article.



Sayeedud-Din—Common Indian Herbs.

For explanation see end of article.

FISH LADDERS IN THE PUNJAB.

BY

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(With a map and two plates).

Most of the common game and food fishes of the Province belong to the *Cyprinidae* (Carps), *Siluridae* (Cat-fishes), or *Ophiocephalidae* (Murrel). The Murrel are not migratory and breed in tanks, ponds and stagnant waters in April and May (Hamid Khan, 1924). A large number of the Carp and the Cat Fishes on the other hand show a tendency to migrate to a greater or lesser extent.

The Mahsir, one of the Carps, is by far the most important migratory species of all the fresh water fishes of India. It is a well known game and food fish. In summer as soon as the streams are swollen by the monsoon rains the Mahsir 'are able to ascend to parts of the river till then unapproachable for want of water. There they find fresh feeding grounds that are inaccessible to them at other times. There they deposit their spawn and thus secure for their fry when hatched, waters, then dwindled to dimensions much better suited to their puny strength than the deeper current of the lower river' (Thomas, 1897).

Most of the other Cyprinidae, too, such as Rohu (*Labeo rohita*), Morakha (*Cirrhina mrigala*), Theila (*Catla catla*) as well as some Siluridae, namely Bachwa (*Pseudeutropius garua*), Khagga (*Rita rita*) and others ascend the rivers during the monsoon rains in search of suitable spawning grounds and after laying their eggs in shallow waters return to the main stream (Hamid Khan, 1924).

It is, therefore, evident that for the propagation of the species of almost all the game and food fishes of the Punjab proper facilities are needed to enable them to ascend the rivers so as to reach such waters as will suit them to lay their spawn.

With the development of irrigation projects in the Punjab, dams or weirs have been constructed in the form of masonry works at the Headworks of the canals for the purpose of deflecting water into the canals. The weirs (Fig. 2) run across the entire width of the river and thus obstruct both the upward and the downward passage of fish. In order to enable the fish to ascend the head waters of the rivers and thus reach their spawning grounds for propagation, or to follow their migratory habits in search of food, fish passes or fish ladders (Fig. 3) have been provided in the weirs.

Weirs have been erected across the following rivers in the Punjab (Fig. 1).

1. River Jumna (near *Tajewala*).
2. River Sutlej (at *Ropar*, *Ferozepore*, *Suleimanki*, *Islam* and *Panjnad*). .
3. River Ravi (at *Balloki*, *Madhopur* and *Sidhnai*).
4. River Chenab (at *Marala*, *Khanki* and *Trimmu*).
5. River Jhelum (at *Mangla* and *Rasul*).

Fish ladders have at present been provided by the Irrigation Department on all the weirs except at *Tajewala*, *Mangla* and *Sidhnai*. Most of the ladders have been in existence for over fifty years or so, but so far hardly any serious attention has been paid to ascertain their proper functioning. A survey of most of the fish ladders was made by the author and the outdoor Fisheries Staff in 1937-38, and as a result of it an attempt has been made in this paper to discuss the working of the ladders and to draw attention to such among them as are either not successful or only very moderately so.

WEIR AND ITS STRUCTURE.

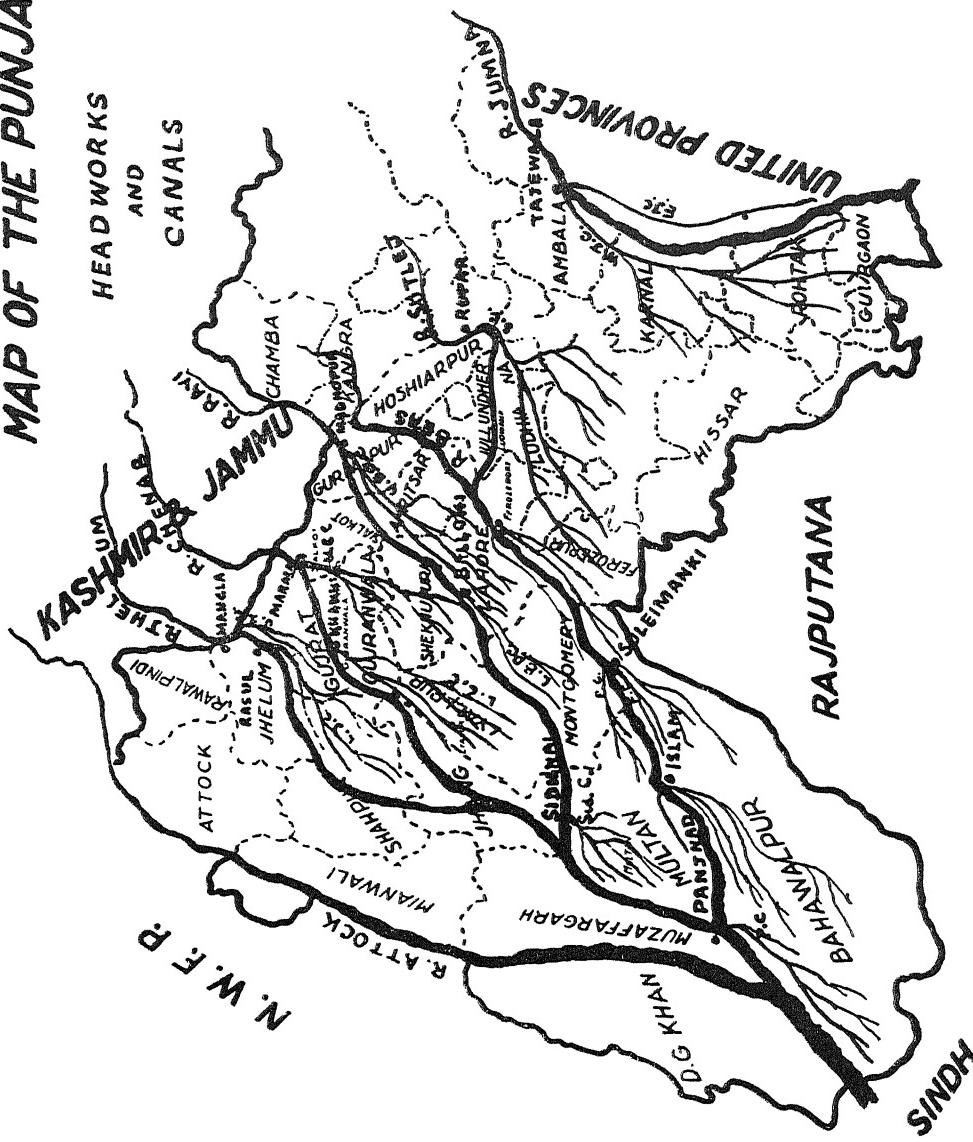
Day, as early as 1873, described in detail the structure of a weir as having 'openings of varying sizes, termed undersluices, constructed for the purpose of permitting the surplus water passing through the body of the weir and on a level with the lowest bed of the river. These undersluices are kept shut except when there is an excess of water in the rivers, as during the monsoon months.' They close by means of iron shutters which can be elevated, when it is desired to do so, by capstan and windlass (Figs. 3 and 4). These narrow undersluices carry such a rush of water through them that no Indian fish can ascend the river when they are open (Fig. 2). Day (1873) recommended as one of the remedies to prevent injury to fisheries 'that every irrigation weir spanning a river have a practicable fish pass in it.' Dunsford (1911) drew the attention of the Punjab Government to the erection of fish passes and suggested certain principles which should be accepted for guidance. In 1916 the Department of Fisheries, Punjab, issued a Bulletin on 'Notes on Fish Ladders,' and recommended the 'Improved Cail Fish Pass' for the Punjab.¹

Different Systems of Fish Passes. 'The underlying principle in the construction of fishways is the retardation of the current velocity of a waterfall so as to enable fish to surmount it.' (Bayer, 1908). In America and on the Continent innumerable devices with that object in view have been invented and proved more or less successful.

¹ The Cail Fish Pass was originally invented by Cail, an Engineer in New Castle, and improved upon by B. M. Hoecht, a German designer (Calderwood 1926). It was not invented by a German designer as is stated in the Bulletin No. 1 of the Department of Fisheries, Punjab, 1916. The Bulletin is out of print now.

MAP OF THE PUNJAB

**HEADWORKS
AND
CANALS**



Bayer (1908) and Calderwood (1926) classify the fishways into four systems according to their style of construction:

1. *The Inclined Plane System*, in which the checks are so arranged that the descending water takes a zigzag course, being driven from side to side by an alternating arrangement of the breaks or baffle walls. Fish are, therefore, forced to take a sinuous course as they ascend.

2. *The Pool or Fall or Step System*, in which the water is brought down to a lower level by a series of short falls with intervening pools. This type of pass was invented by Cail, an Engineer in New Castle. Baffle walls were placed right across the width of the pass so as to form partitions. These were pierced by apertures large enough to allow a fish to pass, but not large enough to allow all the water in the pass to get through. Portion of the water flowed over the tops of the partitions too.¹

3. *The Counter Current System*, in which the descending volume of water is checked by meeting a current opposing it at certain intervals. This pass was devised by McDonald (1882).

4. *Lock and Gate System*, in which a higher or lower level is reached through one or more locks operated by gates.

The systems 3 and 4 above are so complicated that they are practically very little in use now.

MAIN REQUIREMENTS OF A FISH LADDER.

Although every fish ladder, to a certain degree, has to be adapted to meet the special conditions of the locality, yet there are some general principles in all the four systems which may be accepted for guidance.

1. The slope of a fish ladder should not be steeper than one foot vertical to ten feet horizontal, so as to ensure a current of a velocity not exceeding ten feet per second in any portion of the fishway. The flow of the water should be gentle and without deep falls.

2. As regards the dimensions of the fish ladder, both the available volume of water and the size of the fish have to be considered. Since in the Punjab it is to be used by small fish such as Chilwa (*Aspidoparia morar*), not exceeding five or six inches in length, as well as by big fish such as Mahsir (*Barbus tor*), Rohu (*Labeo rohita*), Morakha (*Cirrhina mrigala*) and others which vary from one to three feet or even more in length, the falls should

¹ The Cail Fishway was improved by a German designer Hoecht. 'The improved Cail Fishway' is a combination of the inclined plane system with the pool and fall or step system. It consists of a series of compartments arranged in steps, and separated by a number of cross partitions, which are provided with suitable orifices at the bottom alternating successively from side to side so as to allow the fish according to their individual habits to ascend the fishway by either leaping over the small waterfalls over the cross partitions or by darting through the orifices, at the same time enabling them to rest in the compartments in comparatively still water.

average from eight to twelve inches and the width of each compartment should not be less than ten feet. 'The compartment or bays of the pass must be of such dimensions that the fish do not risk collision with the sides and upper end of each bay when ascending' (Dunsford, 1911).

3. 'Plenty of light should be admitted in a fishway, both for maintaining therein the natural conditions of the water, and in order that the interior may easily be inspected and any foreign matter removed' (Bayer, 1908). 'There must be nothing in the formation of the pass to suggest the existence of a trap' (Dunsford, 1911).

4. 'It should in all its parts, by action of the current of water passing through it, be as nearly as possible self cleaning of all sand, gravel and rubbish' (Bayer, 1908).

5. The water supply should be ample and there should always be water in the ladders in the season when the fish are making the ascent.

6. 'The top and side of a fishway should be above ordinary highwater' (Bayer, 1908).

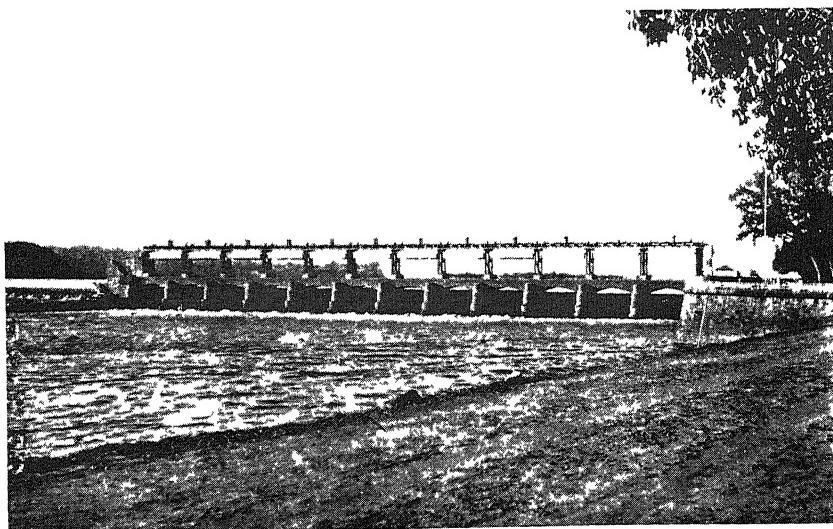
7. 'The pass must be situated where it will be self advertising; i.e. it must form a current impinging into a certain place below the obstacle so strongly that it becomes the chief or predominant current of the stream, when the fish will be led to that point for attempting the ascent' (Dunsford, 1911). 'One may have the best possible kind of pass, but if fish do not get into it one may as well have no pass at all. The position of the entrance is of paramount importance no matter what type of pass is selected. The ideal position for the entrance to the pass is close to where the fish lie, so that there will be an attractive flow of water from the pass, when the river is at the level at which they chiefly run' (Calderwood, 1926). The entrance should be located in a pool at the bottom of the ladder where fish would naturally collect before ascending the river, and these pools must be kept clear of all silt and other accumulations and deposits.

In the light of the knowledge gained from the descriptions of the various styles of fish passes existing in other countries, one may examine the fish passes constructed on the Headworks of the Canals in the Punjab.

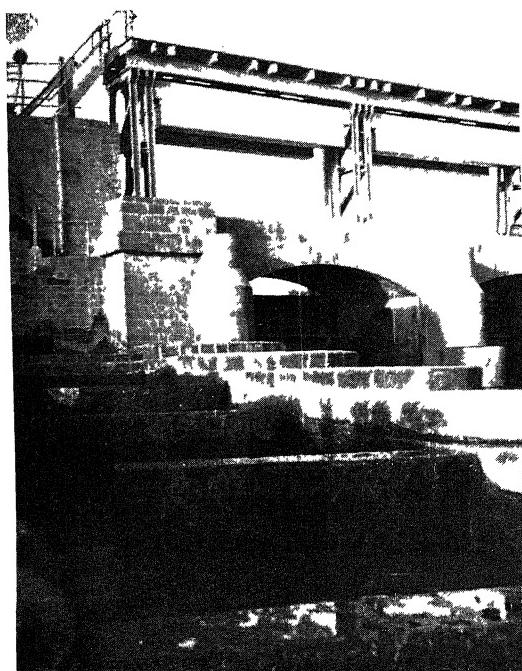
I am indebted to the Executive Engineers, Irrigation Department, Punjab, for providing me with facilities for the inspection of fish ladders and for furnishing me details of their design and construction.

RIVER JUMNA.

Tajewala Headworks. Tajewala, on the River Jumna, 25 miles from Jagadhari, is an old Headworks (constructed mainly between 1870 and 1880), where two canals, the Eastern Jumna Canal supplying the United Provinces, and the Western Jumna Canal going to Delhi and Hissar, take their origin shortly below the point of exit of this river from the hills. At Tajewala the river is furnished with gates for regulating the supply of water



Weir across River Sutlej at Rupar Headworks.



Fish ladder at Rupar.

to the canals. For full nine months of the year the gates are closed and not a drop of water passes down the river, and consequently the upward passage of all the fish in the river below the gates is totally obstructed. There is no fish ladder at the Headworks. It is only during the rains when surplus water is available that the weir and sluices are open to let the water into the main stream. At such time the velocity of the current through the undersluices prevents the fish from ascending upstream.

For more than fifty years the fish in the River Jumna, especially the Mahsir, have been deprived of the opportunity of ascending the hilly tracts in search of their spawning grounds. Mahsir begins to ascend the rivers in April and May and its passage is obstructed by the weir at Tajewala. Towards the end of September the fish in the upper reaches of the river above the weir begin to fall down the stream with the diminishing volume of water after the monsoon floods. At about the same time the sluices and the weir shutters at the Tajewala Head are completely closed and no water escapes into the river. The returning fish consequently pass into the canals. Once the fish have passed into the canals they have absolutely no chance to return to the river, as at Dadupur twelve miles down the Western Jumna Canal there is a rapid of 180 feet length, with a fall of about 15 feet, and it seems almost impossible for any fish to climb the rapid. Such fish are doomed to die and are caught during the canal closure.

A fish ladder at Tajewala is very badly needed, but at the same time it is very essential that it should not be a fish ladder only in name but should be made to work during the months when the fish are on the move. At Dadupur a system of steps and falls might be provided to break the velocity of the current without dismantling any of the existing engineering works.

RIVER SUTLEJ.

Rupar. The weir (Plate I) across the River Sutlej at Rupar for deflection of water into the Sirhind Canal was constructed in 1882 and the fish ladder on the left side of it (Fig. 3) was also built in the same year. Its cost is not available in the records. It had originally fourteen bays. The first bay near the entrance measures 25 feet by 12 feet, the second 33 feet by 10 feet, and the remaining ones 10 feet by 10 feet. An additional bay was added to it at its upstream end and the downstream cross walls were raised by 1.5 feet, and the side walls by 2 feet during 1914-15, at an approximate cost of Rs. 950. The difference between the bed of the river upstream and downstream end of the left side ladder fish ladder (Plate I) in the right flank of the weir was built in 1921 at a cost of Rs. 3,432. It had 10 bays to begin with. During 1926-27 another compartment 7.5 feet by 9 feet was added, and beyond this a counter sunk trough was made for low winter supplies. To reduce the fall and help the Chilwas (*Aspidoparia morar*) to climb the ladder easily, the last two compartments were

split up into four at a cost of Rs. 788. The remaining compartments were also provided with cross walls in 1927-28 at a cost of Rs. 708. In the right side ladder there is a difference of about 9'51 feet between the levels at the downstream and upstream. The flow of water in both the ladders is regulated by means of wooden kurries fixed in the baffle walls. The width of the inlet, and outlet and the openings of the baffle walls is two feet. On the 11th April 1937 the right hand side fish ladder was found to contain two Mullies (*Wallago attu*), two Bachwas (*Pseudeutropius garua*) and one young Mahsir. The fish ladder on the left side, on the same day, was found to have one dozen Mahsir, and a dozen Bachwas, which were found to be ripe. One female Bachwa yielded eggs on slight pressure. The walls of the fish ladder, however, are too low and become flooded when the ladder is running full.

Ferozepore. The Bikaner Canal, the Eastern Canal and Depalpur Canal take their waters from the River Sutlej at Ferozepore weir which was completed in 1929. The fish ladder was originally constructed in 1927 at a cost of Rs. 98,623 and extended in 1929 at a cost of Rs. 15,591.

The fish ladder consists of 18 bays with incomplete baffle walls. The dimensions of the bays are 3 feet by 4 feet with a fall of about 6 inches in each. There is only one fish ladder and the flow of water in the bays is controlled by cement kurries. On the 17th April 1937 the ladder was seen full of Chilwas (*Aspidoparia morar*), young Bhangan (*Labeo microphthalmus*). Big fish such as Mahsir, Rohu, Morakha and others were not met with, but it is said that they move up the ladder, when the head of water on the upstream of the ladder increases and the ladder is running full.

Suleimanki. The Sadiqia, the Fordwah and the Pakpattan Canals take their waters from the River Sutlej at Suleimanki. The weir, and both the right and left side fish ladders were constructed in 1926. The cost of each fish ladder was Rs. 59,000 approximately. The right fish ladder has 24 bays with incomplete walls, out of these 18 bays measure 12 feet by 9 feet each. The first compartment is 19'6 feet by 9 feet; and from the 19th to the 24th measure 7'5 feet by 5 feet. Previously the fish ladder had one long slope as in the *inclined plane system*, and the force of the current when water was run was too strong for fish to ascend. Subsequently, in 1931-32, the floor of each bay was raised at a total cost of Rs. 6,715 to make a fall of 6 inches. The total length of the ladder is 308 feet. The upstream bed of ladder is R.L. 560'9 and the downstream bed R.L. 543'6, the difference being 17'3 feet. The slope is 1 in 15 per compartment in the first 18 compartments, and 1 in 5'6 per compartment in the last six. The dimensions of the openings in the baffle walls are 2 feet, and of the inlet and outlet 3 feet. The water level in the ladder is controlled by kurries. On the 16th April 1937, the right fish ladder was seen to contain Chilwa (*Aspidoparia morar*), Jhalli (*Eutropiichthys vacha*), Rohu (*Labeo rohita*), Kalahan (*Labeo calbasu*) and Morakha (*Cirrhina mrigala*). Chilwa was in enormous numbers

in all the bays. The big fish were seen in the bays at the downstream side. The ladder has been recently remodelled to make falls at its outlets by raising the floor.

The fish ladder on the left side, built on 'inclined plane system' has still got one long slope from the upstream to the downstream with intervening incomplete baffle walls. The force of the current when water is run into it is too strong for fish to ascend at the time when there is no water in the river at the downstream, viz. close to the entrance of the ladder. During July, August and September when the river downstream has water, the head of the water at the upstream end of the fish ladder is not so high, and the difference between the level of the water in the river upstream and downstream is much reduced, the fish are then able to ascend the left fish ladder as well. There are grooves in the baffle walls of three bays; the kurries were put in these on the 16th April 1937 and a fall of 4 feet was thus created. Rohu (*Labeo rohita*), Kalahan (*Labeo calbasu*) Morakha (*Cirrhina mrigala*) and Theila (*Catla catla*) varying in weight from three to five seers were seen leaping near the fall. The fall being too high to be surmounted, the fish fell back in the lower bay.

The fact that one fish ladder is working satisfactorily should not be considered sufficient for such a long weir as that at Sulaimanki. It would be giving a fair chance to fish near the left bank if the left fish ladder were remodelled and made to work satisfactorily throughout the season.

On the day of my visit to Headworks at Suleimanki a number of large sized carp such as Rohu (*Labeo rohita*) and Morakha (*Cirrhina mrigala*) and others were observed leaping against the iron shutters of the undersluices of the weir at places where water was leaking through the interspaces between the shutters and the wall of the weir. On attempting again and again, though invariably in vain, to ascend the narrow vents of the undersluices, the fish became bruised and fell down exhausted on the floor of the apron of the weir and were caught by the canal menials. On such occasions it is almost a common practice to simply hang down baskets and catch the leaping fish.

Islam Headworks. The Bahawalpur, the Mailsi and the Qaimpur Canals take their water from the river Sutlej at Islam. The weir was constructed in 1926, and reconstructed in 1930. The fish ladder was constructed in March 1930, at a cost of Rs. 3,86,752. Though constructed at such a high cost, the fish ladder has never served its purpose. It is more of a fish trap than a fish ladder. It has been constructed inside the Right Divide wall. Starting from the downstream the fish ladder consists of ten bays of trapezoidal shape, each measuring ten feet by eight feet. Further on the ladder consists of forty small compartments. Out of these, sixteen measure 4 ft. 8 ins. by 8 ft. each, and twenty-four measure 5 ft. 4 in. by 8 ft. each. The slope in the upstream compartments is one in twenty-four and in the downstream ones it is one in twenty-seven. The dimensions of the openings in the baffle walls are 1 ft. by 1½ ft. and of the inlet and outlet of the ladder 3 ft. 4 ins. by 4 ft. 4 ins. Kurries are provided in the inlet and outlet

for control of water. The ladder ends blindly in front of the upstream end. There are however two windows, each measuring $4\frac{1}{3}$ ft. by $3\frac{1}{3}$ ft. on each side of the ladder. The fish might enter the ladder from the downstream entrance, but it seems doubtful whether they can jump into the upstream pool through the windows when water is rushing through them with great velocity.

The total length of the ladder is 355 feet and the difference between its upstream and downstream levels is 16.75 feet. But as neither any steps nor a pool at the entrance of the ladder for the fish to collect before making the ascent are provided, the ladder as such has never worked properly.

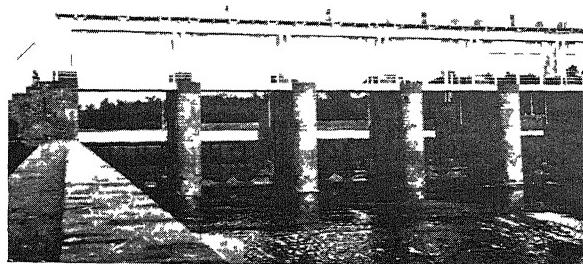
Panjnad Headworks. The Panjnad and the Abbassia canals take their water from the River Sutlej at Panjnad. The weir as well as the ladder were constructed in 1931. The latter being incorporated in part of the length of divide groyne, it is not possible to give its cost separately.

The ladder consists of twenty bays, each measuring 7 feet by 8 feet with incomplete baffle walls, leaving an opening 2 feet wide. It is constructed on the Cail System with a fall of one foot at each bay. The difference between the upstream and the downstream level of the ladder is 20.5 feet. The working of the ladder has not been observed by the writer, but from the reports received it is said to be used both by the small as well as the large fish during the season.

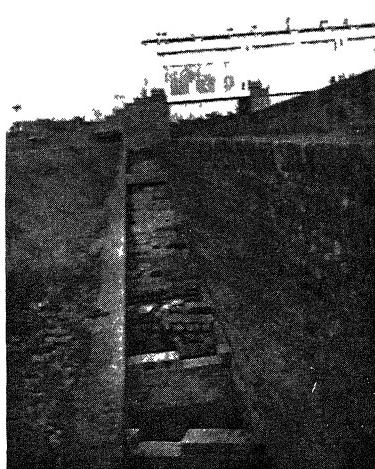
RIVER RAVI.

Madhopur Headworks. (Plate II). The Upper Bari Doab Canal takes its exit from the River Ravi at Madhopur. The weir was constructed in 1870, and for 58 years no passage for the fish existed in the weir. The total length of the weir is half a mile. It was in 1928 that a fish ladder was constructed at a cost of Rs. 4,018. The ladder (Plate II) consists of seventeen bays, measuring 8.5 feet by 5 feet with complete baffle walls, each having an opening two feet wide at its base for the passage of the fish. The fish ladder has, therefore, been constructed on the Cail system. The difference between the upstream and the downstream level of the ladder is 13 feet. The falls are created by means of wooden planks fixed in the grooves in the baffle walls. The slope is one in fifteen. The inlet of the seventeenth bay at the upstream end opens into a compartment measuring 34 ft. by 5 ft. which leads into another compartment measuring 25 ft. by 5 ft. The last compartment opens into the river just close to the inlet of the rafting bay. The flow of water from the river is controlled by gates.

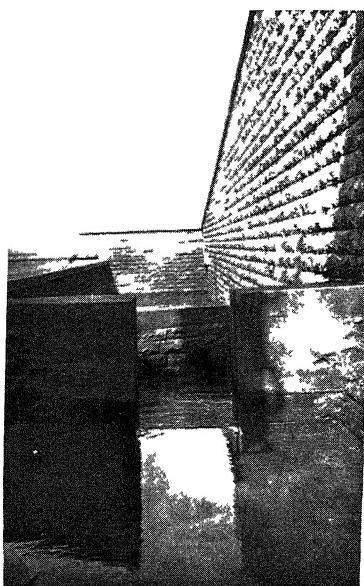
The entrance of the ladder at the downstream end is not very conspicuous. The area in front of the fish entrance is liable to shingle upto a level higher than the minimum water surface level and such shingling closes the entrance and puts the ladder out of action when the river is low. The entrance is located in a divide wall and is not self advertising. Small fish run up the ladder, but the large ones seem to prefer the rafting bay which



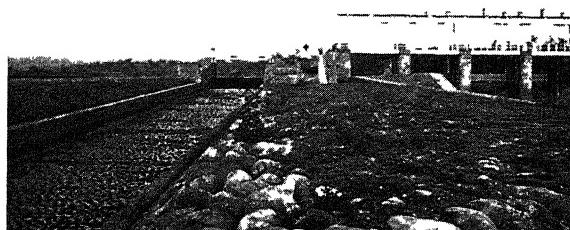
Well across River Ravi at Madhopur Headworks



Fish ladder at Madhopur



Fish ladder at Khanki



Rafting bay at Madhopur.

is 20 feet wide, and lies adjacent to the fish ladder. Whenever the water is flowing in the rafting bay the fish have invariably been seen running up the channel. The fish ladder at Madhopur is, therefore, not working satisfactorily and a design for a new ladder is under consideration with the Irrigation Department. The main data in this design are as follows:—

1. The number of compartments of the fish ladder is seventeen, each compartment measuring approximately 15 ft. by 10 ft., and the total length of the ladder equals 221 feet.

2. The bed of the river at inlet is R.L. 1135.5 and the ladder at tail is R.L. 1124.1, thus the difference is 11.4 feet; the fall is 10.4 in 221 feet. Kurries are used for the control of the water.

3. The opening in the baffle wall is 2.75 feet wide; the inlet is 3 feet wide and 2.5 feet high in winter. The outlet is kept 4 feet wide.

Balloki Headworks. The Lower Bari Doab Canal takes its exit from the River Ravi at Balloki. The weir was constructed in 1913 and the fish ladder in 1921. The total length of the weir is 1646.5 feet and that of the ladder 127.05 feet. The latter consists of seventeen bays, separated by baffle walls. The width of the openings in the baffle wall is 2.0 feet, the inlet measures 1 foot 4 inches by 2 feet 2 inches, and the width of the outlet is 2.01 feet. The bay is of trapezoidal shape and measures 6.3 feet (mean length) by 5 feet. The upstream bed level is R.L. 621.0, and the downstream bed level R.L. 616.5, the difference being 4.5 feet. A drop of 0.8 feet in the water surface level has been allowed in each bay. There is a regulating iron gate on the upstream side to control the water, and kurries are put in the grooves provided in the divide walls so that the working of the ladder can be made more flexible for the difference in the upstream and downstream water levels. Pipes are also fixed at flood levels in order to drain off water for inspection purposes when the downstream water level is R.L. 616.5. The ladder is of a very old type, more or less of the Inclined Plane Pattern, and has never worked properly.

Sidhnai Headworks. Three Canals namely Sidhnai, Fazilshah and Koranga take their waters from the River Ravi at Sidhnai. The weir was completed in 1886. There has never been any fish ladder provided in the weir for the passage of fish.

RIVER CHENAB.

Marala Headworks. The Upper Chenab Canal takes its water from the River Chenab at Marala. The weir at Marala was constructed in 1910 and the fish ladder, though not definitely known, is also reported to have been completed in the same year. It is an old type of ladder, more or less on the lines of the Inclined Plane System, with straight baffle walls, and is wedged in between the two high walls of the weir. There are six compartments measuring 12 ft. by 10 ft. each. The difference between the upstream bed and the downstream bed of the ladder is 6.17 feet. The slope is one in fifteen. The width of the openings of the

baffle is 2 feet. The flow of water in the ladder is regulated by wooden kurries. Its last two compartments had been dismantled during the course of certain experiments by the Irrigation Department. No fish was seen in the ladder on the 19th April 1937. The ladder, does not seem to have fulfilled its purposes. It requires extension for at least 30 feet or so, so as to join it to the deeper parts of the downstream of the river. The side walls as well as the baffle walls should be raised to prevent overflooding of the ladder as otherwise the movements of the fish will be hindered.

Khanki Headworks. The Lower Chenab Canal takes its exit at Khanki from the River Chenab. The weir was constructed during 1889-92 and its length is 4403·5 feet. The fish ladder (Plate II) was originally constructed in 1912-13 at a cost of Rs. 1,427, but was dismantled in 1934-35 and substituted by a new one 203 feet in length at the same place, and being a portion of the constructing undersluices in Bay No. 8 its cost separately is not available. The new fish ladder consists of 16 bays, with incomplete baffle walls. The dimensions of the openings in the baffle wall is 2·5 feet (Fig. 6). The slope is one in ten. Arrangement for the control of water is by kurries in compartments and by gate at the entrance of the fish ladder.

It has been designed on the system of improved Cail Fishway but is not self advertising. The entrance to the ladder is 3 feet wide and is on one side. No fish has ever been reported to use it so far. Further improvements to the ladder are under consideration and it is intended to make falls of 15 inches at the entrance of each compartment or 'bay'.

RIVER JHELUM.

Mangla Regulator. The Upper Jhelum Canal takes its water from the River Jhelum at Mangla. There is no weir across the river at this Head and a natural shingle bar in the river bed serves the purpose. There is, therefore, no fish ladder at the head.

Rasul Headworks. The Lower Jhelum Canal takes its exit from the River Jhelum at Rasul. The weir was constructed in 1901 and the fish ladder was completed in the same year at an approximate cost of Rs. 15,200. It consists of 7 bays, six measuring 13 ft. by 10 ft. each, and 21 ft. by 10 ft. at the entry, with incomplete baffle walls leaving an opening of 3 feet width for the passage of the fish. The dimensions of the inlet are 10 ft. by 7·5 ft. and of the outlet 3 ft. by 3 ft. There is an under shot gate at the entry with which the regulation is done. There are kurries in the baffle walls to control the water in the bays. The ladder has been constructed on the Cail system and is almost identical with the one at Marala. It is too steep and there is a heavy flow of water. It has not worked very satisfactorily and has only occasionally been used by small fish, such as Chilwa (*Aspidoparia morar*), during the season. Bachwa are very rarely seen ascending the ladder to reach their spawning grounds in the upper reaches of the river.

CONCLUSION.

Most of the fish ladders in the Punjab are ineffective and their main defects are:— (i) the majority of them are too steep and too narrow; (ii) the upstream inlets are generally too severe to allow the smaller species of the migratory fish to ascend; (iii) the downstream openings in most cases are too small, and therefore too inconspicuous to be perceived by the ascending fish, that is to say, the fish ladders are not self advertising; (iv) there is hardly any pool at the entrance of the ladders where fish could collect before ascending; (v) the water supply in the ladders is not available during the periods when the fish migrate; and finally (vi) the majority of them are not fish ladders but mere fish traps for catching fish.

The effect of inefficient fish ladders in the Punjab is beginning to be felt in the higher reaches of the rivers and there seems to be no doubt that as a result of it the stock of fish in the Punjab rivers has decreased very considerably during the last fifteen or twenty years. The Honorary Secretary, Dehra Dun Fishing Association, has drawn the attention of Government of India to the following fact: 'We believe the Mahseer, the most important of the Indian fresh water fishes is being gradually wiped out and we submit the question of conservation of the species is a matter of such importance as to deserve the most careful consideration.'

Water is no doubt of far greater importance to the prosperity of the Punjab than fish, but if the cost is not unreasonable, the question of improving the fish ladders and keeping them working requires consideration and attention.

The indiscriminate slaughter of fish in the canals which run for thousands of miles in the Province has continued for more than sixty years. The destruction of fish life in the canals during the closure period was brought to notice as long ago as 1873 by Day, and in 1888 by Thomas, and again in 1911 by Dunsford; but unfortunately, so far, no action seems to have been taken in the matter of adopting suitable measures to save the fish from such a wholesale destruction. In short, ineffective fish ladders in the weirs, total absence of any passes in the canals, existence of unsurmountable falls at the heads of most of the canals, and the indiscriminate slaughter of fish during the closure period, seem to be the main factors responsible for the deterioration of our inland fisheries.

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WILD ELEPHANTS IN ASSAM.

BY

J. E. HALL.

(*With a plate*).

There must be dozens of shikaris, like myself, who have been, or are mad keen to 'bag' a Rogue Elephant. Well Assam is the place for them to go to. For years, one of my boyhood ambitions had been to track and shoot elephants. 'Thirteen years amongst the Wild Beasts of India' by that famous 'Hathi-King' G. P. Sanderson, served to keep the flame of desire burning bright. That ambition was eventually realised after twenty years.

A few years back the shooting of elephants, except for an occasional 'Proscribed Rogue', was totally prohibited. Such Rogues when very occasionally proclaimed, were soon destroyed by local sportsmen; long before any '*bandobast*' could be made by an outsider. The steadily increasing popularity of the motor-car has however ousted the elephant from favour; and the present demand for these useful beasts from Rajas and wealthy Indians is very small in comparison to former years. With little or no organised Keddah catching operations and strict protection, wild elephants have so increased in numbers that in certain areas they are a menace to cultivators; and as a result have to be controlled.

Early in 1938, several 'Rogues' were proscribed in various parts of Assam and I made up my mind rather suddenly to have a try at shooting some of these. Imagine me, therefore, having landed in Gauhati, without any '*pucca bandobast*', not even knowing where to go to find elephants. Luckily there was an old school-fellow stationed there: and he very kindly gave me a letter of introduction to the local Forest Officer.

In the course of my Shikar wanderings throughout India, I have met dozens of Government officials; but for 100 per cent. sheer sportsmen give me those of the I. F. S. The local D. F. O. not knowing me from Adam, was the sheet anchor of my hopes; and believe me I was not disappointed. Within a few hours he had fixed me up with an Elephant Control License which empowered me to shoot any solitary male elephant. Tuskers to be balanced by Makhnas. He also advised me in what areas in his Division elephants were reported to be doing damage and, as a final effort, gave me a letter to his subordinate officers, asking them to help me in my trip. As an A. 1 sportsman, in the true sense of the word, I take my hat off to that D. F. O. May his shadow never grow less. Having arrived at a place called Ranigodam, near where a Rogue had been reported, I installed myself in the local Dak-Bungalow. This is where I came up—hard—against the Assamese villager. Not a man, cart, or service of any description were to be hired or bought. Payment was no consideration, they just would not face the work. Quite possibly some of the 'Mahaldars' or lessees of elephant catching, who were operating in that area, engineered this boycott.

They probably reasoned that if I started shooting bull elephants their operations would be spoilt by the wild elephants retiring back into tribal territory. Nor could I hire tame elephants, they were all engaged in *Mela-Shikar*. I was now in despair; the immediate prospects of success were very remote. At this very unpleasant moment, the D. F. O's ranger came to the rescue. A very quiet and reserved young man, his suggestion was that I shift my camp to a village called Chakardah, about 6 miles away; and that at this village I could get into touch with a retired pensioner of the Assam Rifles, a Gurkha, called Balbahadur, who had the reputation of being a famous shikari.

We decided on action, it took 8 hours to raise a bullock cart from the villagers; yet when it was produced the hire demanded was reasonable enough. This I personally paid into the village head-man's hands, and he seemed surprised to get it. It afterwards transpired that the Mahaldars had let out a rumour to the effect that I was requisitioning men and carts without payment, being a military officer. What a libel on the unfortunate military! Later on the Mahaldars became friendly, when they realised that I was not interfering with their business.

Having set out in pouring rain, I arrived like a drowned rat, to find Chakardah most depressing. A fairly large village nestling at the foot of dense jungle clad hills, with a large swampy lake as a foreground, and a few paddy fields scattered about. We managed to get shelter in the Forest Guard's *chowki*, a single-roomed hut, that bore evidences of a recent attempt by a wild elephant to pull it down. It was quite isolated, having as its solitary neighbour Balbahadur's shack. The swampy lake was filled with resident species of wild duck, paddy birds, cranes, etc.; whilst all day long herds of semi-domesticated buffaloes grazed in the swamp grass tended by Gurkhali herdsmen. Balbahadur soon entered into an agreement with me and in no time produced an Assamese tracker named Kuttru, and another non-descript assistant. Kuttru, I may say, was an excellent tracker, who never lost a trail, and that, in spite of the fact that the tracks we were following were crossed and confused continually by those of herd elephants. Up and down the bamboo covered hills, through Taraban swamps, Ringal cane thickets, lantana, it was the same to him. He would lead you right up to an elephant and say '*Maro*'. I once asked him if he ever felt afraid, and his reply was most amusing and to the point. I give it verbatim. 'You have come to shoot elephants not I, so long as you don't run, I won't, if you do, I'll go home. The last Babu-Saheb who came after elephants ran away after wounding an elephant, and we were nearly all killed. If it comes to running, rest assured I can run and climb trees much faster than you, and in any case my business is finished when I take you up to the elephant'. When not tracking, his chief amusement was to wade into the swamp, in pouring rain and spear fish. He caught an enormous number of a sort of mudfish, which he carefully dried for future consumption. I once tried a couple fried and they were very tasty, so that he had to

provide a couple for my breakfast whenever we were not out tracking.

Balbahadur on the other hand was a most taciturn individual, seldom spoke unless directly addressed, was slightly deaf and absolutely fearless. He never backed a step when facing elephants and I veritably believe would rather have been killed than lose *Izat* by showing fear. His chief relaxation I may say was drinking large pegs of my whiskey, neat. Every performance being followed by frightful grimaces and the explanation that Whiskey kept fever out of his stomach. He had a head, and could down half a bottle without showing any effects. On one trail we lived on whiskey and tea for nearly two days, most of the time in pouring rain; and were never really dry. His prescription must be right as I never got fever, to which I am rather prone in the jungles.

A couple of blank days were spent in trying to pick up the Rogue, which however had disappeared after demolishing a couple of cooly huts at a nearby tea-garden, following up this exploit by chasing two Nepali sawyers who were cutting timber in the forest.

He then wound up by eating all their provisions, including some rice tied in a red cloth, cloth and all. Confirmation of this feat was forthcoming when his droppings were found. These were plentifully garnished with scraps of red rag.

During the course of my wanderings on this shoot, I came across a 'Mithun', a type of hybrid Gaur found in Assam. He gave an easy shot as he fed in some short grass on the opposite side of a ravine about 80 to 100 yards away. I could have bagged him easily, but having no license for Game in this area, very reluctantly had to let him go, as to-date I have never bagged a 'Mithun'. I also saw a Red Serow, a rare animal, but this peculiar brute raced downhill into a dense Ringal cane thicket. Several times we came across pig, sambhur, kallij pheasant, *jungli moorgi*, and once one misty morning walked into a tiger on his kill—a village cow. I should have shot him, as actually he was on village land, but not knowing this at the time I was not chancing the forfeiture of my elephant license by being accused of poaching. Both Balbahadur and Kuttru urged me to shoot this tiger, though we were all on foot within a few yards; and they had the pleasure of saying 'I told you so'; when we heard from the Ranger, that this beast was a nuisance having killed several buffaloes engaged in timber dragging and that I should have shot him as permission had been obtained for his destruction.

Eventually during the course of our wanderings, we came across a village of Garo tribesmen, high up in the hills. These were not the real wild type, rather semi-civilised fellows, and they gave us *khubbar* of two solitary elephants in the jungles. They were quite willing to work for me and wanted us to visit their village. This suited my purpose admirably, as it solved the problem of transport; I was also tired of Chakardah and its everlasting swamp. To settle the business I tramped straight on to their village just

as I was, and we celebrated our arrival by getting our hosts to throw a feast of roast pig and rice beer. Of course I had to pay for these festivities, which waxed loud and long; and had the satisfaction of dining alone on tea and tinned sausages in isolated splendour in the Forest Guard's beat hut. Such are the disadvantages of keeping up one's prestige. My shikaris enjoyed themselves, but had the sense to send out a party of men early next morning to bring in my kit, servant, etc. This party returned with everything by 11 a.m. Good marching as the total distance involved was 14 miles up hill and down dale through heavy forest.

The next afternoon we picked up the tracks of an enormous solitary elephant, the print of whose forefeet gave a circumference measurement of 65", or a computed height of 10'-10". The tracks were about a day old and we followed them till nightfall, through the most impossible places, up and downhill almost vertically, in regular giant staircases of elephant tracks; through Tara-ban swamps, up to our waists in stinking mud and water, through dense rattan-cane thickets that dug millions of vicious barbs into one and tore clothes and skin to shreds. Periodically we stopped to scrape off leeches, as fat as my little finger, with the gorge that they had had of our blood. I invariably burnt these dreadful pests. This devil-ridden elephant never seemed to stop, his tracks showed that he was moving fast. That night we all went to sleep on the banks of a brawling tumbling stream that looked beautifully fishable. No fires were allowed and we huddled together cold and hungry. Towards midnight we heard the trumpeting of a herd of wild elephants, away to the south-west; later a single elephant rushed madly up the valley we were sleeping in, most probably after catching our wind. What with mosquitoes, cold, hunger and excitement, I hardly slept a wink. Towards morning I dozed fitfully, and woke to find that Balbahadur had made some tea; and that Kuttru and Bangté, the Garo Headman, had gone on ahead tracking.

A hasty wash, followed by some whiskey-tea and we pushed on; some hours later we contacted with Kuttru, and he was a case of 'nerves'. It appeared that he and Bangté, whilst following the elephant, had been most viciously charged. I had my doubts, but these were allayed when we came to the scene of action. We could see where the elephant had circled back to a bamboo clump, from where he had charged the two men from not more than 15 yards. The tracks of his charge were deeply imprinted on the soft soil as his direction was downhill.

He had then crossed a swamp and ascended the opposite hill which was covered with dense bamboo thickets. Kuttru with a most ridiculous looking *dah* in his hand took up the tracks, but as these were now so clear I took the lead. The wind was wrong and the advance was made with great caution. I may state that I smoked continually, this being the easiest way of testing the breeze in these dense damp forests, where sand, a wet finger, or fluff are alike useless. The elephant, as we found later, had crossed the ridge and circled back along the top of a spur running



Kamrup, Assam. Rogue Elephant—9' 7" Tusks, R 3' 11", L 3' 9";
Circum 1' 1", Weight 34 lb.



Kamrup, Assam. Rogue Makhna, 10' 2".

west. We must actually have passed him within 60 yards, but much below his line of scent or smell. On topping the ridge, I was following up the tracks, when Kuitru, who has the eyes of a hawk, spotted the elephant 40 yards away behind a dense bamboo clump, on our right. The beast was perfectly motionless. To get a shot at this distance was impossible, there were far too many interlacing bamboos and besides the elephant's quarters and tail were towards us. He looked a monster, reddish brown in colour, quite unlike the usual black tame ones. I got *pucca* stag fever, my hands shaking with excitement: Kuttru looked at me in a very superior and pitying way and I mentally promised to box his ears when the show was over. Balbahadur quite frankly suggested that I sit down and recover my nerves, whilst he had a crack at the elephant. Recovering myself I got them behind a bamboo clump, whilst the Gaios made themselves scarce. I then crept up behind the bamboo clump, till only this separated the elephant from me. He seemed very suspicious and kept swinging his head and tunk from side to side apparently to catch the wind. I then saw for the first time that he was a *makhna*, or tuskless male. I had no qualms about shooting him, owing to the conditions of my license. How long I waited I don't know, probably not more than a minute. I then discovered that Kuttru had crept up to me without a sound; he suggested in a whisper that I step to the right of the clump and as the elephant swung round to face me, to let him have it. I did so and stood up, without a sound the elephant swung towards me and I let drive mid way between his ear and temple. With a great scream he came round but fell onto his knees, and whilst he was struggling to rise, I rushed up and fired just above the bump between his eyes. He heeled clean over and I had bagged my first elephant. Besides the natural exultation I felt, I must admit to pangs of regret at having destroyed so magnificent a beast. Measured between uprights, as he lay, from the top of his shoulder to the sole of his forefoot, he tared 10' 2"; the circumference of his right forefoot in death was 62". In my opinion he stood about 10'-5" in height (vertical) at the shoulders; and this measurement was confirmed by his rubbing marks on various trees. His tusks were both broken off short at the gum, but for a *mukhna* were still exceptionally long and thick. When his carcase was seen by the Mahouts engaged in *Mela-Shikar*, they said that he was the biggest elephant seen in these parts for years; and was known as a notorious crop raider, who occasionally chased people about, but he was not a man-killer; and had been living solitary for many years. They estimated his age as between 80 and 100! The ears were very ragged and showed a great amount of turnover. The bulk of the body was enormous. In a couple of days no one could go within a mile of the place due to the terrible stench.

The next few days were devoted to observing wild elephants and their ways, whilst scouts were sent out to hunt up the recent tracks of the other solitary elephant,—the Rogue. One morning

as we were on our way to a salt lick, situated in a narrow valley where we hoped to see elephant and with luck Mithun, we heard a herd approaching in the opposite direction. We rushed a little way uphill and sat tight and were soon rewarded by seeing 8 cows and 3 calves walking along in Indian file, not more than 50 yards distant. The moment the leading cow crossed our tracks, she stooped dead and tested the wind, in no time her trunk swung in our direction and every other elephant followed suit including the tiny calves. Right about wheel, canter, seemed to be next orders and they shuffled away uphill as fast as they could go with a tremendous crashing. The whole movement was executed as if on a parade ground and we all had a good laugh at the gravity of the little fellows. Another afternoon, Kuttru, the valiant, led me right up to two young tuskers, that had temporarily left a herd. The larger of the two was about 8' 6" in height with light tusks, Khuttru called him a *Khuru-Dantal* the other was not above 6'-o", with tiny tusks just protruding from his jaw. The blood-thirsty tracker wanted me to shoot both. I got to within 5 yards of them and climbed a tree to get some snapshots. It was delightful to see how they caressed each other with their trunks and how the smaller copied every movement of his elder brother, even to rubbing his forehead on the same tree.

Eventually Balbahadur, who originally had lagged behind, came blundering on the scene, upon which the elephants rushed off down-hill. They just bounded down like dirty black rubber balls, the smaller of the two coming an awful cropper over a log in the grass. He looked such a clown with his head on the ground and his hind legs stubbing the grass, that I sat and roared, sending off the herd that was in the valley crashing away at a great pace.

One day when following up a solitary *ganesh* or single-tusked elephant we ran slap bang into a herd, which he had suddenly joined up with. The place was a sort of natural amphitheatre, a flat, tree covered hollow, surrounded by high bamboo covered hills, with steep sides. The herd was right around us, split up into what appeared to be family groups, all resting under the shade of the trees. The two nearest groups were all cows and calves, then a solitary *makhna*, not however anything as large as the one I had shot. Not far from him and close to a group, headed by an immense old cow, stood the '*ganesh*'. Unlucky brute for me, had I caught him up when solitary, I was justified in shooting him, as he was a known crop-raider; but within the shelter of a herd he was in sanctuary and inviolate. His one tusk was every bit of 65 lbs. if not more, as thick as my thigh and projecting 4 feet from his jaw, stained the colour of nicotine, with the point rounded and blunt. Out of his head, it would have gone to 6'-o" in length. Balbahadur, as usual, got us all into trouble. Close to where he crouched, about 15 yards to my left, was a pinky-grey calf; the little chap could not have been more than a few weeks old, he was trying to pull down a creeper with his tiny trunk. Balbahadur spotted this prodigy and crept to within a

yard of it. He had a shawl in his hands and seemed to be trying to tie its hind legs together, in an effort to capture it. At this moment the old cow spotted him and with an unearthly scream charged headlong at him. Pandemonium is the wrong word to describe the next few moments. The entire herd consisting of some 40 animals, rushed over everything screaming, bamboo clumps were scattered, the individual stems cracking like rifle shots. The whole place was like an inferno, only, instead of comparatively benign devils, there were dozens of infuriated and frightened elephants. I hardly know what happened to the rest, I saw Kuttru and the Garo shin up the hillside and Balbahadur dodge behind a bamboo clump. I ran across to him and was nearly run over by a couple of runaway cows. The *mukhna* was screaming just the other side of our clump, so we faded silently away up the opposite hillside to Kuttru and the rest. The *ganesh* had disappeared, and by the time we had rejoined forces, the herd who were still in possession of the arena, started filing away. We counted 33 animals, but others had already made good their escape. Later on we heard from the Mahouts that they had captured 2 young elephants from that herd a few days previously, one of them being a young tusker whose dam was the old and vicious cow. She and the *makhna* had then turned on the *koonkees*, or catching elephants, and severely pummeled a valuable female, whilst the rest showed such a pugnacious disposition, that they had decided to leave this herd alone. One of the Mahaldars offered me Rs. 500 to catch the calf we had seen, as it was supposed to be an albino and very valuable. He also offered to lend two *koonkees* and his Mahouts, *phandees* or noosers, and pay all expenses. His Mahouts were however a miserable opium eating lot; and he a great sharper, so that nothing came of his proposal. On the other hand, some Gurkha Mahouts and *phandees* in the service of another Mahaldar, were a desperate gang. I did one hunt with this lot, as a paying guest; and they did show sport. Having closed up to a herd, away they rushed in, cutting out two half-grown young with their *koonkees*. There were two of us in this particular case, and we followed that calf through swamp and bamboo, along the valley. My companion *koonkee* did the actual noosing, as she was a leggy and fast female. My mount being a much slower *makhna* who however came up in time to help in the final roping and tie-up. I finished that little jaunt more dead than alive with not a square inch of skin on the inside of my legs. You must know that these *koonkees* are not fitted with pads, only ropes, and one has to hang on with hands, teeth and toes; but falls to rival those experienced in pig-sticking are frequent. I paid the promised 'bakshish' to my Mahout and was thankful to get off his elephant alive, and with no bones broken; any more sport of this description would have meant a lengthy stay in hospital for me. I may add that my part in the hunt was to beat my mount with a thick stick over the rumps, to make him move faster, as I had displaced the *charkatta*; only two being carried per Koonkee in this Mela-Shikar. You may guess that

I did nothing of the sort being too busy hanging on for dear life. Whilst our pair of *koonkees* were successful, another lot had a fearful time, one of the *phandees* being swept off his mount by a trailing creeper, his *koonkee* was useless for further catching; the other had to cut loose the calf they had noosed, as he was too big for their mount—a very light female, and besides dragging her along, very nearly choked himself in the noose as a result. Altogether a very successful hunt; and the Mahouts considered me very lucky and wanted to take me out again, but one experience sufficed. However all good things end, and I returned to Chakardah on my way home. On my very last night in the jungles, the Rogue, who had protected his hide so well that we never once caught a glimpse of him in spite of continual hunting, staged a grand *Finale*; which ended in his enriching me with his beautiful symmetrical tusks. I had finished packing my kit and rifles, and after a hot bath, the first for many days, had turned in amidst the unwonted luxury of warm blankets, clean sheets, and silk pyjamas. I was asleep almost before my head touched the pillow, and was in the middle of a vivid dream, wherein a monster elephant with long curly tusks, absolutely impervious to all bullets was chasing me; when a fearful scream from an elephant made me wide awake. Balbahadur rushed to my hut from his own, and shouted elephant; meanwhile the screaming and noise went on, added to which were loud shouts and wails from the village where the Mahaldars had picketed their *koonkees*. I developed some latent energy that I consider is unexampled. Within half a minute I was rushing to the scene of tumult in my pyjamas and slippers, with the heavy rifle in my hands and the last 7 cartridges I possessed. To get there I had to wade through an arm of the swamp and cross some 400 yards of flooded paddy fields. In the process, I lost my slippers, lost my bearings and landed up to the armpits in a bog. Some of the Mahouts with a lantern, rapidly came on the scene and extricated me. Whilst rushing me along to their lines they gasped out their story. This summed up was to the effect that during the day a solitary bull *dantal* or tusker had been seen following one of their *koonkees*—a *makhna*. This latter had been showing signs of 'musth' and as a result had been securely chained up that evening. Towards nightfall he started showing signs of great restlessness. About midnight, an elephant trumpeted in the jungle nearby, to which the *makhna* answered and about a quarter of an hour later, when they were all asleep, the wild tusker crossing through the out-lying part of the village, came into their lines. The first intimation they had of his presence was when he attacked the tame *makhna*. The screams of the latter awoke them in a fright, when they noticed that he was bleeding from a wound near the shoulder, inflicted by the Rogue. In spite of their shouts and the waving of lighted fire-brands, the Rogue, who had backed away at their first approach, again charged the unfortunate *makhna*, driving one of his tusks into the base of the latter's trunk. Eventually the tusker knocked down the *makhna*, not a difficult task as the

latter's fore-legs were shackled by chains. By this time the entire village was in the utmost confusion, men, women, and children, ran about screaming that their last day had come. The *makhana* continued his terrible screams as the wild tusker pummelled and kicked him. The moment I arrived was very nearly my last; in pitch blackness, under a steady drizzle of rain, a horde of frantic men, women and children laid hold of me. At this moment a Mahout came running up with a firebrand and the tusker who previously had not been visible under the shade of the trees, stepped forward into the circle of light about 50 yards away. In the mad stampede that immediately ensued, I was swept into a ditch by the solid wave of humanity that rushed back; with fists, legs and gun-stock I had to fight my way clear otherwise I would have been suffocated. As this ditch was practically an offal pit for a nearby cattle pen, my odoriferous condition can be better imagined than described. Eventually, with myself standing guard over the tusker, Balbahadur, my orderly and the Mahouts, drove the panic-stricken villagers into the comparative safety of the cattle-pen, thereby clearing the field for action.

Supported by Balbahadur flashing the electric torch onto the tusker's head and carrying my second rifle, we started the attack. The tusker fronted us and came on; when he was about 10 yards away I let drive into the spot where I judged the bump of his forehead was placed. He swayed to the shot and recoiled backwards, then recovering himself rushed us without a sound; Balbahadur dragged me back into a Lantana bush. As the elephant passed I fired for his ear, but hit him in the centre of his neck, as by this time I was firing in the dark; the blasted torch having dropped in the confusion. He screamed loudly to the shot, and appeared to be half paralysed, as he started moving in a blind sort of a way, very slowly, uphill. I ran alongside in the thick Lantana, and fired three times at his head, trying to brain him, but in the dark could not get the correct spot. Fumbling in my pocket I discovered that I had only one cartridge left, one having dropped out in the confusion at the ditch. The elephant was now standing in a dense clump of Lantana, so I ran right up to him and fired into his ear from about three yards. He dropped like a stone without a sound, just missing crushing me; as he had been on higher ground than myself. I literally escaped by inches. As it was I fled after taking the shot, as by this time my nerves were in shreds. The first to come up to me with a smoke was Balbahadur, who had been close behind; and I stopped to recover as much of my courage as I could. The rest of the crowd soon followed, and we jauntily announced the death of the Rogue. A 'stripped to the skin bath' followed at the elephant lines, and I put on some clean clothes, but was much too excited to sleep immediately. We sat up with the Mahouts gossiping and yarning, drinking copiously of tea laced with whiskey. They were fullsome with their praises, stating that they had never met any *Saheb* before, brave enough to shoot a *goonda-dantal* by night. I did not edify them, by saying that in actual truth, funk had dried up my throat to such an

extent that I was left with a raging and apparently insatiable thirst.

Next morning after cutting out the tusks, I decided that as the carcase was within a hundred yards of the nearest huts, it was absolutely necessary to bury it, to prevent an epidemic when it rotted. The villagers absolutely refused to do this, in spite of my offering whatever wages they demanded. They said that it was too much labour and in any case the carcase would soon rot. Luckily the Forest Ranger came that morning, and he soon impressed some Garos and Cacharees who did the job. It was terribly tedious; whilst the coolies dug an immense pit, I had to cut up the carcase with Balbahadur. We were at it till 4 p.m. The above incident is typical of the attitude of Assamese Mikiri villagers. They just will not do any manual labour unconnected with their daily lives, whether paid for or not. To the men who had sweated all day, I paid the agreed amount of Rs. 25/- plus as much country-grog as they wanted, and they were very contented. They fully deserved every pice of that money. Late that evening the Ranger boated me back across the swamp up to the main road, where I soon caught a bus back to Gauhati.

I will not weary the reader with instructions how and where to shoot wild elephants; suffice to say that by Assam Government ruling the rifle must be a H. V. one of not less than 400 bore. He will learn everything there is to know from Sanderson's book. In Assam he must be prepared to travel light and foot-slog for miles. Carriage is very difficult to obtain and the use of tame elephants, unless he has local friends impossible. Tea laced with whiskey, following 5 grains of some quinine compound, twice a day is the best fever-preventive. Shooting rules in Assam are very strict, and Fees and Royalties ditto. This is excellent as, at least in the Forest Reserves, it prevents indiscriminate slaughter, as was the case in years gone by. I have no actual experience, bar Elephant shooting, of the Forest Reserves; an omission that I intend to rectify no sooner funds permit. I should think that in some of these Reserves the shooting, though terribly difficult, will compare with anything the rest of India can produce.

Measurements. Mâkhna Bull Elephant. Vertical height 10'-2" but actually estimated at 10'-5"; Circumference of right forefoot, in death, 62". Tushes 226 tolas the pair. Rogue Tusker: vertical height, 9'-7", circumference of right forefoot, in death, 4'-8½" Tusks, Right. 3'-11"×13" girth at the gum; } Weight 34 lbs.

Left. 3'-9"×13" girth at the gum; } the pair.

I forgot to add that in cutting out the right tusk we found a Martini-Henry slug embedded in the skull. This had traversed the tusk and entered into the bone of the skull, splitting the tusk for about 18" of its length inside the socket. The pulp of the tusk was in a diseased condition, smelling horribly; and in my opinion was probably the sole reason why this animal turned into a Rogue. He must have been wounded by either a crop watcher or shikari, and subsequently must have been in agony for the rest of his life. The tusks are a beautifully matched pair, with sharp pointed ends.

NOTES ON INDIAN EUPHORBIACEAE: CROTON
BONPLANDIANUM (C. SPARSIFLORUM) AND
EUPHORBIA PERBRACTEATA.

BY

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Thanks to the friendly interest of several botanists who have furnished material and data I have been able to give attention to certain Indian *Euphorbiaceæ*, native or introduced, the taxonomic status of which was thought to be questionable or unsatisfactory. Two of these plants, both weeds of cultivation, are the subject of this contribution.

(A) CROTON BONPLANDIANUM¹

This is the introduced *Euphorbiacea* known to Indian floristic work as *Croton sparsiflorus*. Its synonymy is fairly extended although by no means one of the largest in the records of this badly known genus. So far I know it, it stands as follows:

CROTON BONPLANDIANUM Baill. in Adans., iv, 339 (August 1864); *C. Bonplandianus* [sphalm.] Mueller-Arg. in DC. Prodr. XV, ii, 661 (1866) and in Mart., Fl. Bras. XI, ii, 116 (1873) [sub *C. Persicaria*].

C. pauperulum [*C. pauperulus* sphalm.] Muell.-Arg. in Flora, XLVII, 485 (October 1864), DC. Prodr., XV, ii: 671 (1866), Mart. Fl. Bras., XI, ii, 242 (1873).

C. sparsiflorum [*C. sparsiflorus* sphalm.] Morong [sphalm. auct. Indic. 'Morung'] in Ann. N.Y. Acad. Sc., VII, 22 (1892); Brühl in Jour. Proc. As. Soc. Bengal, IV, 604, 635; 642, 649, 652 (1908); Haines, Bot. Bihar, Orissa,

¹ *Croton* was used by Linnaeus [Sp. Pl. II, 1004 (1753)] as neuter generic name and by Mueller-Arg. [in DC. Prodr. XV, ii, 512 *et seq.* (1866)] as masculine, most modern authors following Mueller's preference. Article 72 (1) of the International Rules of Nomenclature, 1935, statutes that a Greek or Latin word adopted as a generic name retains the gender assigned to it by its author which is known to have for result that the same Greek or Latin name is masculine, feminine or neuter according to the letter of the original publication. A modification of Art. 72 (1) was proposed [cf. Syn. Propos. Nomencl., VI, Inter. Congr. 58 (1935)] to the effect that generic names must follow their classical gender. This proposal, at first voted upon favourably [cf. Proc., VI, Inter. Congr., 356 (1936)] was eventually accepted only as a recommendation (cf. o.c., 357), which leaves the matter practically unchanged under Art. 72 (1). I regret that under the Rules the specific names of the majority of the synonyms of *C. Bonplandianum* must here be changed to the neuter gender, because this further complicates the synonymy. *Croton Bonplandianum* was published as neuter by its author, Baillon.

II, 105 (1921); Gamble, Fl. Pres. Madras, II, 1316 (1925); Mayuranathan, Fl. Plts. Madras vicin., 267, pl. 31 fig. d (1929); Joshi in Curr. Sc. II, 344 (1934).

C. rivinoides Chodat in Bull. Hb. Boiss., sér. ii, I, 395 (1901).

The centre of distribution of this most vigorous weed is Paraguay, in South America. It occurs as far north as the temperate foothills of the Andes of Bolivia and is locally abundant in the warmer Andean and Pampean states of the Republic of Argentine. It is not reported from Uruguay by Herter [Estud. Bot. Reg. Urug. 79 (1930)], although it certainly occurs there. I have seen no specimens from the Rio Grande do Sul and other southern Brazilian states, where it can not be wanting. Various collectors record it as a weed of waste lands, banks of rivers and thoroughfares, several times gathered in the street of Asunción, Paraguay.

The history of *C. Bonplandianum*, briefly told, is the following: Aimé Bonpland collected it, apparently for the first time, at the beginning of the last century in the 'province of Corrientes', i.e. in an unreported locality near the common boundaries of Argentine, Paraguay and Brazil. It was almost simultaneously described by Baillon and by Mueller of Aargau, the latter having received through J. D. Hooker a specimen collected by Tweedie in the Andean region of Argentine, near Tucumán. For reasons unexplained, Mueller twice reduced *C. Bonplandianum* to *C. Persicaria*, which is a very different species. Thomas Morong brought it back from Paraguay, where he had been collecting between 1888 and 1890 and named it as new with the binomial under which it has since then been known to the majority of taxonomists. Chodat, eventually, introduced in the record a third synonym which has remained practically unused.

Compiling from the literature I find the following main records for *C. Bonplandianum* (*C. sparsiflorum*) in India: 1897, Chandur, Akhārēra, Brahmanbaria; 1898, Chittagong; 1901, Sibpur; 1907, Tippera; 1917-1921, various localities in Orissa; 1922, Madras and along the coast of Coromandel south to Tinnevelly; 1929, the greatest part of the districts of Madura and Tinnevelly; 1931, Benares; 1932, Sylhet and Gauhati. It is a foregone conclusion that *C. Bonplandianum* is scheduled to overrun in time most of India and, probably, a wide area of tropical Asia and Africa.

According to Brühl (o. c., 603) it was Prain who first identified this weed as *C. sparsiflorum*, Prain's specimens being probably still preserved under this binomial in the herbarium of the Botanic Garden at Sibpur. It should be interesting to verify the notes on this material, ascertaining how Prain, who did not record the species in 1903 together with the *Croton* from Bengal, came to learn of Morong's binomial. It stands distinctly to Prain's credit to have recognized the species with fair accuracy, considering how involved and unsatisfactory is the classification of *Croton* now current.

The illustration supplied by Mayuranathan is good and the account of Brühl is excellent despite the fact that in this account

are found minor errors of citations and one omission, occurring in the quotation of Morong's original diagnosis. Having seen an Indian specimen of *C. sparsiflorum* in the herbarium of the Royal Botanic Gardens at Kew (Haines 4165, 'naturalized near Cuttack 1917') and types or isotypes of *C. Bonplandianum*, *C. pauperulum* and *C. rivinoides* in various European and American herbaria I am satisfied that the introduced weed recorded by Indian botanists and the South American *Croton* are precisely the same species. Individual specimens vary much in size, depauperate forms being scarcely 8-12 inches tall with narrow, acuminate, dentate-serrate leaves. Specimens which I have grown in the hothouse from seed received from Dr. F. Schade, of Villarica, Paraguay brought forth leaves up to 8 by 4 inches in size and showed great vigour, ultimately measuring fully 3 ft. in height.

In Brühl's account it is suggested that had Hooker known *C. Bonplandianum* (*C. sparsiflorum*) he would have listed it near *C. Wallichii*. So far as it applies to the habit and the general aspect of preserved specimens Brühl's note is acceptable, but the true affinities of *C. Bonplandianum* are not with *C. Wallichii* and its group. In the present state of classification it is unadvisable to make final statements on the subject of the affinities and sectional divisions of *Croton*, both Indian and foreign. At this time it seems correct, however, to refer *C. Bonplandianum* to sect. *Astraea* (Kl.) Baill., as typified by *C. lobatum*, this being another weed of cultivation that also probably occurs in India.

(B) EUPHORBIA PERBRACTEATA

This weed is of special interest to students of Indian phytogeography because it might prove to extend to the Deccan the range of forms such as *E. striatella* and *E. teheranica* that so far are believed to be restricted to the Iranian tableland. *Euphorbia pauciradiata* Blatt., which is known to me only from description, is possibly a third species of this group.

In describing *E. perbracteata* [Bull. Bot. Gard. Kew, xxvii, 238 (1914)] Gage warned that it was being confused with *E. dracunculoides* and *E. Rothiana*. Despite Gage's note the confusion persisted and Sedgwick took notice of it, writing an elaborate and in some respects very informative paper [J.B.N.H.S., xxvi, 599 (1919)] to show that different plants were included under *E. Rothiana*. Unfortunately, Sedgwick ignoring Gage's species, identified *E. perbracteata* with *E. laeta* Heyne [in Roth, Nov. Pl. Sp., 230 (1821)], an invalid binomial on account of the previous publication of *E. laeta* Ait. [Hort. Kew, ed. i, II, 141 (1789)], which is usually accepted as a synonym of *E. dendroides* L. Haines taking up *E. perbracteata* [Bot. Bihar and Orissa, ii, 145 (1921)] neglected in his turn Sedgwick's contribution. The outcome of these imperfect listings is that *E. perbracteata* is scarcely better known now than it was before 1914, a peculiar state of affairs considering that this spurge is one of the easiest to identify and has been twice described at length within five years.

Sedgwick states it *always* has 3 rays at the umbellaster. Gage describes it as carrying 2-4 rays. These notes are not contradictory; Gage described few specimens only, and knowing that in *Euphorbia* the number of rays is variable figured out an average. Sedgwick wrote from direct personal observation. All the specimens which I have seen had 3 rays. In addition to this unusual and peculiar number of rays, *E. perbracteata* may be further characterized as follows; (1) the glands of the cyathium are neither horned nor smooth at the margin, but coarsely and irregularly toothed; (2) the bracts surrounding the cyathia are conspicuously veined, ribbed and often connate at the base; (3) the specimens in herbarium have a pale green colour, usually fewer leaves than *E. dracunculoides* and *E. Rothiana* and a manifestly annual root; (4) the seed appears to be intermediate between that of *E. dracunculoides* and *E. Rothiana*: it is more or less mottled and the testa is very nearly smooth. The seed of *E. dracunculoides* is roughened from an irregularly distributed thick whitish aril and is lacunose at the testa. The seed of *E. Rothiana* is grayish and smooth throughout.

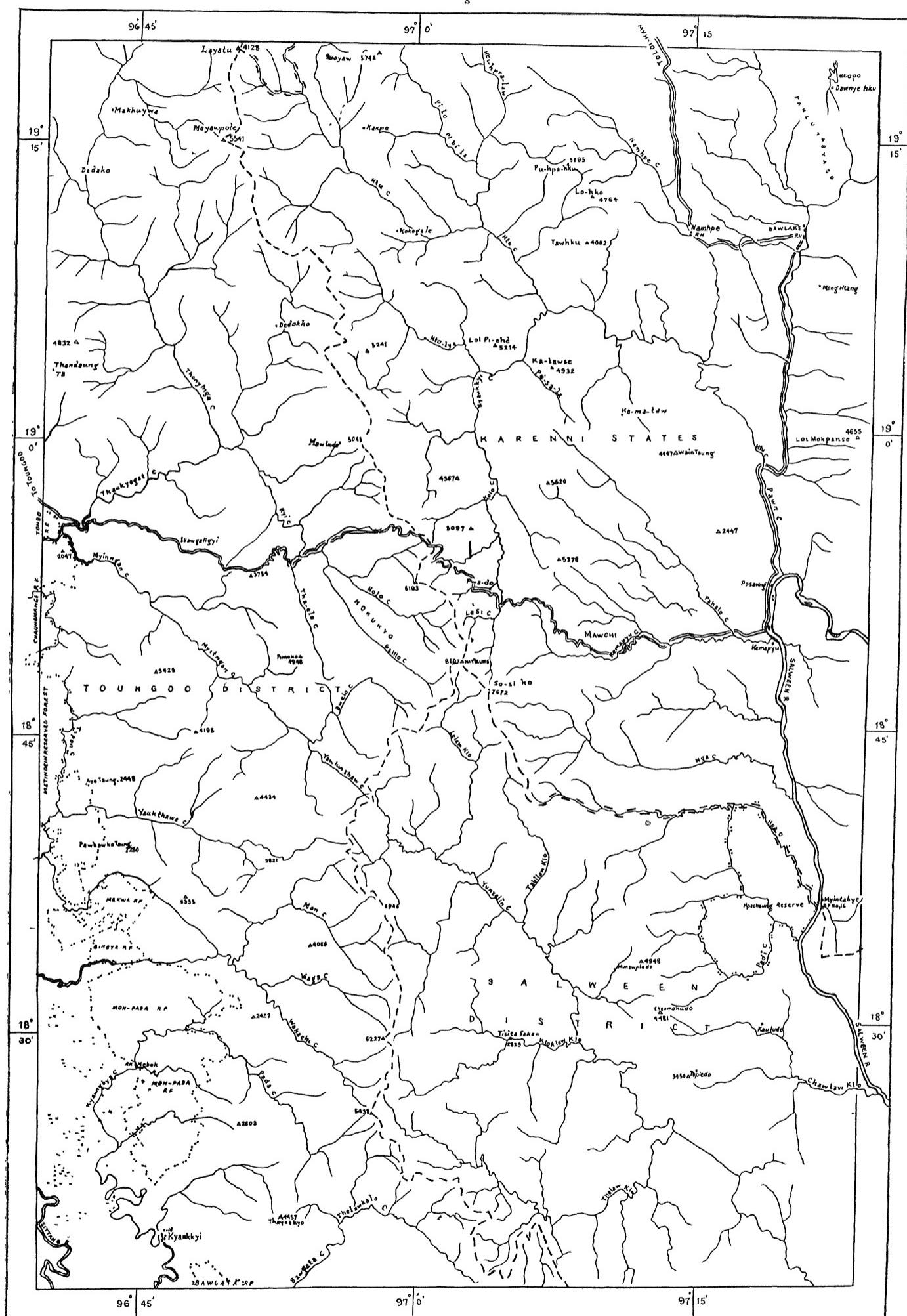
Gage gives as range the United and Central Provinces; Sedgwick restricts the species to the region of Bombay and the Carnatic, stating, however, that its range is probably wider; Haines reports having collected it only in cultivated fields as a seemingly introduced weed, but cites it from Behar on the faith of Kurz. I believe at this time that the region of Bombay is the locality of India where this spurge is actually endemic because, as it has been stated, its affinities appear to lie in the direction of Persian endemics. More extensive collections are needed, however, to define the range and the affinities of this peculiar species. While Indian *Euphorbia* occurs in South-Western China, there in part native (e.g., *E. Rothiana*, *E. proliifera*, *E. Royleana*) and in part introduced as it seems (e.g., *E. dracunculoides*), I have never seen *E. perbracteata* collected outside of India. This limited distribution is peculiar in a weed of cultivation. I suspected at first that the species has definite edaphic preferences and a strictly winter-cycle of growth. This did not prove to be the case because seeds collected near Poona in February and sown in America in May, in the hothouse, germinated in less than one week, producing extremely vital seedlings, even sturdier than those of *E. dracunculoides* and *E. Rothiana*. Under the circumstances it is surprising to learn that *E. perbracteata* is unknown in the great majority of the herbaria: I stand under deep obligation to Prof. S. S. Kumar, Economic Botanist to the Government, Poona, who collaborated to my work with specimens and viable seeds.

To conclude these notes it may be pointed out that Sedgwick is much misinformed in listing *E. Rothiana* Spr., of Sprengel, Syst., iii, 796 (1826) and Boissier in DC. Prodr. XV, ii, 156 (1862), as a synonym of *E. perbracteata* (*E. laeta* of Sedgwick, not of Aiton nor Heyne). I have seen numerous authentic specimens of *E. Rothiana* and *E. oreophila*, some bearing Boissier's own identification, not a single one of which is in any way representative of *E. perbracteata*.

MAP OF COUNTRY
ROUND NATTAUNG, KARENNI STATES

SCALE 1" = 4 MILES

S



REF E R E N C E S.

District boundary	...	...	...	---
Reserve boundary with name of reserve	...	...	...	MON-PABA R.F.
Chauk (Stream)	...	...	...	NEAC
Metalled road	...	...	...	—
Trigonometrical Station with height in feet	△	8607		
Clinometric height	2821

NOTES ON THE BIRDS OF NATTAUNG, KARENNA.

BY

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With Systematic Notes by

DR. C. B. TICEHURST, M.A., M.R.C.S., M.B.O.U.

(*With a map*).

Description of the locality.—Nattaung (8,607 feet) is the highest point in Southern Burma on the Sittang-Salween divide. The boundaries of Toungoo District, Thaton District and Karenne meet on the summit (Lat. $18^{\circ} 49'$ North, Long. $19^{\circ} 02'$ East). The annual rainfall is not less than 110 inches, probably considerably more.

Below 5,000 feet shifting cultivation has been so extensive that the whole area consists of secondary growth of various ages and density, with pine, oaks and chestnuts predominating, and virgin forest is confined to a few precipitous gorges unsuitable for cultivation. Above 5,000 feet very little cultivation has been done, and virgin forest covers the area.

In what follows the nomenclature adopted is that used by Champion in 'A preliminary survey of the forest types of India and Burma', *Indian Forest Records*, Volume I, Number 1 (to which a reference is invited). Four climax types and two seral types occur on Nattaung.

1. (Group 1a C2) Eastern tropical evergreen=Evergreen.

This type occupies steep north facing slopes from 5,000 to 8,000 feet, and also occurs in moist pockets and along the streams in the other types. The following is an extract from Champion's description:

'Lofty, dense, evergreen forests 150 feet or more high... the canopy is extremely dense... epiphytes are numerous... ground vegetation in typical cases may be almost absent, elsewhere a carpet of *Strobilanthes* or *Selaginella* and ferns may occur; grasses are absent... Erect bamboos are unusual but may occur locally.'

1a (E 9) Southern wet bamboo brakes=Bamboo brake.

This type occurs here and there in the preceding type. 'Bamboo brakes are usually found along streams or on badly drained hollows more or less displacing the tree forest... the brakes are often very dense, even if the bamboos grow in clumps'.

2. (Group 7b C₃) Burma Sub-Tropical Hill Forest=Oak forest.

This type is a buffer between the pine forest and the evergreen; it grades into temperate forest (see below) at about 6,000 feet. 'Hill forest of good height and density, the dominant species being mostly evergreen though some large briefly deciduous trees occur. The total canopy density is much less dense than in the tropical evergreen and the large trees rarely stand close together. A shrubby undergrowth is always present and grass is absent. Bamboo may be present or not. The type is characterised by the prevalence of oaks and chestnuts, *Quercus* and *Castanopsis*'.

3. (Group 8 C₂) Assam-Burma Pine Forest=Pine Forest.

This type occurs on south and east facing slopes from 4,500 to 8,000 feet, and covers large areas but is restricted to well drained soil. 'Typically a practically pure association of pine (*Pinus khasya*) but very generally considerably influenced by the annual or periodic fires which take place. Typically no other trees occur in the top canopy, there is practically no underwood, and even shrubs are few, but where moisture conditions are a little more favourable there tends to be an underwood of *Quercus* and other broad-leaved trees. These trees, mostly evergreen species, increase with rising altitude leaving the pine on the warmer, drier ridges and as scattered standards. A grassy soil cover is usual . . . climbers and bamboos are absent'.

3a. (2S/2) Burma subtropical hill savannah=Savannah.

'Grassy downs with scattered clumps or single trees usually pine and oaks'.

This type only occurs as a small area of a few acres on the top of Sosiko.

4. (Group 10b C₂) Assam-Burma wet temperate forest=Temperate forest.

The higher slopes of Nattaung, above about 6,000 feet are covered by this type, with a few outliers of pine forest and evergreen; it is like a dwarf form of oak forest with which it intergrades, and is distinguished by low rounded crowns and short boles, dense bamboo undergrowth (*Arundinaria elegans* Kurz), and alpine elements in the flora.

'Closed evergreen high forest of trees of large girth but medium height, rarely over 80 feet, and usually with large branching crowns festooned with mosses and larger epiphytes . . At the high elevations a dwarf bamboo undergrowth is very generally developed and may be very dense and uniform over large areas'.

Oak and chestnuts are prevalent; *Rhododendron* occurs in the pine forest outliers over 7,000 feet.

The period spent on Nattaung was from April 8th to April 16th. The locality was reached by lorry from Toungoo in eight hours by the road recently opened by the Mawchi Mines Company. The first camp was at mile 82, ten miles over the Karen boundary at

about 5,000 feet; from here the lower slopes were worked and a general survey of the locality made. After three days a move was made with cool transport over a thousand foot ridge to a camp on the Lesi chaung, at about 5,000 feet, from which the summit (8,607 feet) could be reached in about three hours steady climbing. From this camp also Sosiko (7,571 feet) was visited, a climb of seven hours along the eastern watershed of the Kolo chaung. Possible camping sites nearer the main ridge were noted, from which the higher elevations could be worked with greater ease.

The time spent on the mountain was short, and new records were still being obtained on the last day, so that the birds recorded below can only be an incomplete list of the avifauna.

Dr. C. B. Ticehurst, to whom we are greatly indebted, has identified all the skins, and his systematic notes and remarks appear in square brackets at the end of each form.

[The first collection to be made in Karennei was in 1861 when Major Lloyd travelled through the country. His birds were said to have gone to the East India Company's Museum in Calcutta and so far as we know have never been reported on. In 1874 Wardlaw-Ramsay accompanied Major Lloyd on an expedition to the capital of Karennei, Kyai-pho-gyee (Kyebogyi). The expedition entered the Karen Hills from Toungoo on March 5, and after a halt at the capital for a week and a visit to the Shan frontier it started to return on March 30, crossing the Karen Hills 50 miles north of the outward journey and reached Toungoo on April 10. The highest elevation reached on this trip was 6,000 feet. The collection of 400-500 birds of about 150 species is in the British Museum. Ramsay wrote a short account of the trip (*Ibis* 1875, pp. 348-353) but the exact itinerary and a full list of birds was never published. A brother officer of Ramsay spent some weeks in the hills at 3,000-7,000 feet in April and May and gave such birds as he collected to Ramsay and it was no doubt this officer who visited Nattaung which is mentioned as a locality that *Siva strigula* was obtained at in a further paper Ramsay wrote on Burmese birds (*Ibis* 1877, pp. 452-473). Ramsay also sent his collector into Karennei and it was he who first obtained *Sitta magna*. Other new birds were described in short notes by Walden and by Ramsay either from Karennei or the Karen Hills. All the information on Karennei was, of course, incorporated in Oates' *Birds of Burma*.

So far as we know no one since then has done any collecting in Karennei; from December 1877 to April 1888, and from May 1888 to December 1888 Leonardo Fea toured in the Karen Hills near the Karennei boundary; his collecting places being Leito (Leiktho), 30 miles N.-E. of Toungoo; Yado, 30 miles N.-E. of Leito; Taho, 8 miles north of Yado and Chialla 25 miles N.-E. of Taho. His collection contained 467 specimens of 165 species; eight were described as new and five new to Burma. Salvadori gave a full account of it. (*Ann. Mus. Cir. Genoa—Ser. 2*, Vol. vii, 1889). Since then various Englishmen have been in the Karen Hills at Thandaung, but no connected account of the birds has

been written. Farther south Davison collected round Papun and Kyaukhnyat and his birds were reported on by Hume in his 'Birds of Tenasserim' (*Stray Feathers*, Vol. vi, 1878).]

Corvus macrohynchos.

A few birds seen near human habitation between 5,000 and 6,000 feet.

Dendrocitta formosa subsp.

Occasionally heard in the pine forests about 5,000 feet.

Parus major subsp.

Birds seen on several occasions in clearings and in pine forest.

Machlolophus spilonotus subviridis.

3 ♂ : 2 ♀.

Frequents oak and pine forests between 5,000 and 7,000 feet. Not seen above this elevation nor in evergreen. Has a pleasant little song. Seen on many occasions in parties working through high undergrowth or in the crowns of low pines; not uncommon.

Aegithaliscus concinnus pulcheilus.

1 ♂ ; 1 unsexed.

Seen on two occasions in parties working through long grass and secondary growth on a steep hillside near the Mawchi road at 5,500 feet. Another party was seen working rapidly through the crowns of low pines on the edge of cultivation at 5,000 feet.

Suthora poliotis feae.

1 ♀.

Specimen obtained in dwarf bamboo at 8,000 feet on the final slope of Nattaung. One other bird was seen, in regrowth at 4,500 feet, working through the bushes like a *Phylloscopus*. Does not appear to be such a skulker as described in *F. B. I.*

[This single specimen agrees with the description of *feae*. From *riponi* (Mt. Victoria) it differs in having the white moustache smaller and in having the breast grey, dividing the black throat from the ochraceous underparts. It was described by Salvadori from Taho in the Karen Hills and has not since then been met with. I do not know on what grounds Fort Stedman is given as a locality for this bird in the *Fauna*, ed. ii; there are no specimens in the British Museum and no records from Fort Stedman.]

Psittiparus gularis gularis.

3 ♂ ; 2 ♀.

Common in shrubs and understorey trees in oak and pine forests between 5,000 feet and 6,000 feet. Not seen in evergreen. A pair of very excited birds observed at close quarters in pine forest on a ridge top at 6,000 feet behaved as if they had a nest close by. Has a harsh chattering note.

Sitta magna magna.

1 ♀.

Shot in pine tree at 5,500 feet. Seen on one other occasion in pine forest. Has a distinctive tri-syllabic call, like the cough of an angry gibbon.

Sitta frontalis corallina.

1 ♂ ; 1 unsexed.

Fairly common in the oak and pine forests up to about 6,000 feet.

Garrulax moniliger.

Seen in evergreen at about 5,500 feet.

[In the British Museum there are specimens from Karenni and these are intermediate between *moniliger* and *fuscata*.]

Trochalopteron erythrocephalum ramsayi.

4 ♂; 4 ♀.

The common Laughing-Thrush of these forests, being found in all types where undergrowth is heavy. It is particularly partial to bamboo brakes in evergreen. Has a loud call 'wee-ou-wee-whip', the last note higher and louder.

[Mr. Deignan (*Proc. Biol. Soc. Washington*, Vol. LI, pp. 87-92, 1938) in dealing with the southern group of the Red-headed Laughing-Thrushes unites *ramsayi* with *melanostigma* on the grounds that the species is very variable, that the characters of *ramsayi* are not constant and that *ramsayi* has no geographical range. He further states that it would seem that Ogilvie-Grant selected from the series those that suited his purpose, i.e., fitted with his description of *ramsayi*. In the British Museum there are six or eight specimens from Karen, Karen Hills, Byingyi Mt. in Loi Long, Pine Forest of Salween (which means Kyaukhyat district) and Yengyi Palaung in Lauksawk; in addition there are available two from Byingyi and eight from Nattaung.

The first thing that strikes one on assembling these is the constancy of the characters of *ramsayi*. Assembled with a series of *melanostigma* from Mt. Muleit in Tenasserim the two series stand out in marked contrast. Ogilvie-Grant was right in separating them and the supposition that he picked specimens to suit his ideas is insupportable. The second noticeable thing is that all these *ramsayi* come from the very definite area of the Sittang-Salween watershed, with the possible exception of Yengyi Palaung which I have not been able to localize. This area, I may remark, is rather notable for the peculiar and local races it supports—*Leioptila m. castanoptera*, *Leioptila m. saturata*, *Siva cyanouroptera oatesi*, *Suthora poliotis feae*, *Ixulus humilis clarkii*, *Aethopyga nipalensis karenensis* are some of them—and so there is nothing remarkable in finding a recognizable race of this *Trochalopteron* there. That odd birds resembling *ramsayi* may occur outside its range does not negative the validity of the race when 100% within the range are recognizable.

In this series the upper parts are greyish-olive with just a tinge of rufous on the hind collar; the chestnut of the throat is extended down over the breast and belly in a paler tint between Ochraceous Tawny and Ochraceous Orange (Ridgway XV). Only the flanks are olive and even these are tinged with the same colour.]

Trochalopteron ripponi.

1 ♂; 1 ♀.

The two specimens were obtained in oak and pine forest near the top of a ridge at about 6,000 feet. Not nearly so common as the Red-headed Laughing-Thrush.

[Though said to be the commonest Laughing-Thrush of the Southern Shan States, the occurrence in Karen is an extension of range farther south.]

Pomatorhinus olivaceus subsp.

Seen and heard frequently in regrowth at about 5,000 feet.

[No form is recorded from Karen and specimens would be highly desirable; *olivaceus olivaceus* is the form of N. Tenasserim; in Southern Shan States *ripponi* occurs, so the form in Karen must remain doubtful at present. The relationship, too, of the group to the *schisticeps nuchalis* group requires much further careful collecting; it may be that, though both certainly occur close together, *olivaceus* is the high elevation form. *P. nuchalis* was described from Thayetmyo.]

Pomatorhinus erythrogenys imberbis.

2 ♂.

In pine forest at 6,000 feet. Two were shot out of a party of *Turdus obscurus*. No other records.

Pellorneum ignotum cinnamomeum.

1 ♂.

Shot in grasses in regrowth on top of a pine ridge, near the ground. One of a pair.

Napothena brevicaudata venningi.

1 ♀.

Two birds seen together in the bed of a rocky stream in evergreen (with pines just above) at 5,000 feet. The bird seemed very excited and perched on a low branch making a noise like the two described under No. (225) in the F. B. I. No other birds of the kind seen.

[The type of *brevicaudata* came from Muleyit and *venningi* from the 'Southern Shan States'. It was obtained by Craddock on 23 March 1902, and no further locality was specified. Craddock was, however, on Loi Mai in Mongpawn on 7 April 1902 so that *venningi* probably came from near there. On Byingyi in Loi Long State *venningi* occurs, so that its extension now to S.-W. Karennei is an addition to our knowledge.]

Stachyrhynchus chrysaea assimilis.

1 ♂; 1 ♂; 1 unsexed.

Fairly common both in regrowth and also in the undergrowth in evergreen, often associated with parties of *Alcippe*.

Stachyridopsis rufifrons rufifrons.

1 ♂.

Obtained in bamboos in oak forest at 6,000 feet. The only bird seen.

Alcippe fratercula fratercula.

4 ♂; 3 ♀; 2 unsexed.

Very common at all elevations above 5,000 feet in all types of forest.

Schoeniparus dubius dubius.

2 ♂; 1 unsexed.

Seen on many occasions in low, dense undergrowth or grasses between 5,000 feet and 7,000 feet in all types of forest. A great skulker. A chattering note 'chit-chit-chit-chit' constantly repeated and also a distinctive call note 'chee-chee-chee-chee-chee-chee-hpwit'. Almost certainly nesting.

[The type came from the outskirts of pine forest above the Salween and this must have been in the Papun-Kyaukhyat area which may be fixed as the type locality. It has not been recorded from Karennei before and is a useful extension of range, as in the Southern Shan States the form is *intermedius*.]

Pseudominia castaneiceps castaneiceps.

3 ♂; 2 ♀; 1 unsexed.

Found chiefly in temperate forest above 6,000 feet; but occasionally seen in other types. They are confiding little birds and allow a close approach. In habits they are arboreal, climbing about moss- and lichen-covered trees and climbers. Do not ascend up into the crowns of the trees but work the trunks up to about 30 feet. They run up and down, under and round branches rather like Nuthatches do. Quite common.

Heterophasia picaoides cana.

1 ♂.

Obtained at 6,000 feet in oak and pine forest out of a party of about 6 birds. The call is a loud whistle 'Whee-whee-weou-weou', the last two notes dropping in pitch.

[I have recently been able, through the kindness of Mr. Deignan, to examine a topotype series of *cana* and I must confess I see no difference. In describing *burmanica* I was misled by the description of *cana* and the fact that the only *cana* available to me were paler than Indian birds. The characteristic feature of the form, however, is the shorter tail, not the pallidity of the underparts, as I pointed out in describing *burmanica*.]

Leioptila melanoleuca castanoptera.

2 ♂.

The distinctive mournful call of this bird, 5 notes on a descending scale in a minor key 'whee-ou-hoo-hoo-hoo'. was heard all over these forests from 5,500 feet upwards. A low chattering note is also uttered while feeding. This was the only species obtained or seen.

[The type of *castanoptera* was obtained by Fea about 60 miles N.-E. of Toungoo in the Karen Hills. It is a bird of very limited distribution. The northernmost locality is Kalaw and the southernmost is the present one at Nattaung. It is evidently, like some other forms, confined to the hills dividing the Sittang from the Salween valleys.

That there has been some confusion of the forms of this species is hardly to be wondered at; *melanoleuca* was described in 1859 from Mt. Muleyit, N. Tenasserim. In *Stray Feathers*, Vol. vi, p. 294 Hume gave a minute description of this form. He says . . . 'ear-coverts black in some specimens with a slightly browner tinge . . . central tail feathers narrowly, the rest broadly tipped with pure white, . . . back, scapulars, lesser and median coverts a deep, somewhat chocolate brown.' In 1889 Salvadori described *castanoptera* from the Karen Hills which differed from *melanoleuca* chiefly in having the greater coverts and most of the tertials chestnut instead of black. In the *Fauna*, Ed. ii, Stuart Baker called attention to two birds in the British Museum from N.-E. Central Burma with upperparts black and named the form *radcliffei*. To be more precise one came from Kyetpyin near Ruby Mines (and is the type) and one from 'My Pai Hill, Salween'.

Finally de Schauensee in 1929 named a form from N. Siam as *laeta* which was said to have the ear-coverts dull black, the colour of the back different to that of *melanoleuca* and *radcliffei* and to have the tips of the four central tail feathers rather dark grey. The author apparently did not compare his specimens with specimens of *melanoleuca* and *radcliffei* and was misled by relying on descriptions only,—always a somewhat risky procedure.

To deal with each form in detail; *castanoptera* can be dismissed in a few words. It seems to be a perfectly valid form of very limited distribution extending along the edge of the Shan plateau from Kalaw in the north to Nattaung in the south. It certainly is a local race of *melanoleuca* and not a species, as has been stated, as I find that single specimens of *melanoleuca* from the hills east of Fort Stedman have just a trace of the chestnut markings of *castanoptera*. I think there can be no doubt that *melanoleuca*, *radcliffei* and *laeta* are all one form; *laeta* can be dealt with quite shortly as through the kindness of Mr. H. G. Deignan I have been able to compare freshly obtained birds from Siam with recently collected specimens from the Ruby Mines (*radcliffei*) and the two series are precisely the same. The supposed differences between *melanoleuca* and *radcliffei* are explained by fading. Recently collected birds from Taunggyi in Southern Shan States are *radcliffei*, one collected there some years ago is now *melanoleuca*, as are others from Southern Shan States of equal date. One collected in 1923 at the Ruby Mines was identified at the British Museum in the same year as *radcliffei*; it is still there and today is *melanoleuca*.

I may note that Hume was not too precise in calling the tips of the central tail feathers pure white; in the specimens he examined the tips of the four central tail feathers were almost worn off; what is left of them is grey, not white like the tips of the laterals. He called the ear coverts black, in some slightly brown; fading has gone further since then and all the Muleyit specimens now have brown ear coverts. The mantle changes colour with time. Fresh specimens are almost black (*radcliffei*), old specimens have a varying chocolate tinge in proportion to their age in the cabinet.]

Actinodura ramsayi ramsayi.

3 ♂; 2 ♀.

These birds are common in regrowth in oak and pine forests between 4,500 to 6,000 feet. They have a trisyllabic call 'wee-oo-wee', the middle note lower in pitch and reminiscent of the call of Abbott's Babbler. One bird was watched while uttering a 4-note call 'Fee-ou-peee-peee', the last two notes long and rather wailing like the call of a Kite.

Staphida striata striata.

1 ♂; 2 ♀.

Found in thick undergrowth in oak and pine forest between 5,000 feet and 6,000 feet. They go about in parties, sometimes associating with *Alcippe*. Have been seen hanging upside down on twigs like Tits.

[Known from Byingyi, Karen Hills and N. Tenasserim so that its occurrence now in Karennei was to be expected. On the other hand birds from Thandaung a little farther north are nearer *rufigenus*. Further specimens in this area are desirable.]

Siva strigula castaneicauda.

5 ♂; 2 ♀; 2 unsexed.

Common in temperate forest above 6,000 feet. Keep to crowns of trees. Not shy birds.

[The type of *castaneicauda* came from 'Hill Tenasserim' by which was meant Mt. Muleit. On the small material available it has been rather questionable how much the dullness of *castaneicauda* was due to fading compared with *strigula*. But these fresh specimens show that this dullness is a subspecific character; both *strigula* and *yunnanensis* are richer yellow below and more golden on the crown; in *castaneicauda* the bill is larger and the chestnut of the tail seems to be paler than in *yunnanensis* and more extensive than in *strigula*.]

Ixalus humilis clarkii.

1 ♂; 2 ♀.

Parties of 4 or 5 birds seen in pine forest at about 6,000 feet. The birds utter a low 'chuck-chuck' while working through the branches, now and then uttering a 'chir-chir-chir-chir' note. Parties also seen working through secondary growth on steep hillsides near the Mawchi road. One party seen was associated with a party of *Aegithaliscus concinnus*. Erected crests and moustachial streaks show up well in the field.

[This form was hitherto known only from the type locality Byingyi Mt. in Loi Long so that its extension now to the S.-W. corner of Karennei is of interest. It is evidently another of the forms peculiar to the Sittang-Salween divide.]

Herpornis xantholeuca xantholeuca.

2 ♂.

Obtained in pine forest at 6,000 feet where these birds were occasionally seen.

[Not previously recorded from Karennei, though to be expected, as it occurs in Southern Shan States, Karen Hills and N. Tenasserim.]

Cutia nipalensis nipalensis.

2 ♀.

Both specimens obtained on the same open pine ridge at about 6,500 feet. They keep to the tops of trees and utter a loud monotonous 'piou-piou-piou-piou' repeated 6 to 12 times.

Pteruthius erythropygius aerulatus.

3 ♂; 1 ♀.

Found chiefly in oak and pine forest between 5,000 feet and 6,000 feet, but a specimen was also obtained in temperate forest at 8,000 feet. The call of this bird as it works through the tops of pines or oaks is one of the distinctive noises on Nattaung. The call is a loud and mellow 'cha-chew, cha-chew'. One specimen was obtained as it was hopping sideways along the branches of an oak uttering a different call, tri-syllabic in an ascending scale, the first syllable longer than the others. Males appear to predominate in the population, perhaps because they are easier to see.

[These are nearer *aerulatus* than to *yunnanensis*.]

Mesia argentauris.

2 ♂.

Common in regrowth about 5,000 feet. Often associated with parties of *Alcippe*. They utter a chattering note.

Minla ignotincta.

3 ♂; 1 ♀; 2 unsexed.

Two obtained above 6,000 feet, both in open pine forest and also in temperate forest. Not a shy bird. Keeps to the crowns of trees going about in small parties.

[The occurrence of this bird in Karen is a large extension to its known range; the nearest known places where it occurs in Burma are Mt. Victoria in the Chin Hills and the hills east of Bhamo.]

Microscelis psaroides concolor.

1 ♀.

Fairly common in pine forests about 5,000 feet. A bird of the tree-tops.

Ixos maclellandi tickelli.

1 ♂; 1 ♀.

Common in evergreen between 5,500 and 7,000 feet, and also in pine and oak forest near secondary growth.

[The distributions of *tickelli*, *binghami*, and *similis* in eastern Burma require much further study and further collecting is essential.]

Alcurus striatus.

3 ♂; 1 unsexed.

Found in both pine and evergreen above 6,000 feet. Has a number of calls; one bird was shot making a tri-syllabic call with a drop in the middle - whee-too-wheet'. Keeps much to the tops of tall trees.

[Known from the Karen Hills and Southern Shan States but not hitherto from Karen.]

Molpastes chrysorrhoides klossi.

1 unsexed.

Only one pair seen, in shrubs on pine ridge at 5,000 feet.

[I keep this form as a race of *chrysorrhoides* for the time being; the relationships of *klossi*, *nigropileus* and *burmanicus* and their distributions require a great deal of further careful collecting. In some localities two of these forms appear to live side by side, but from all localities in the hills material is utterly inadequate; *chrysorrhoides* is a Chinese form and does not occur in Burma so far as we know.]

Xanthixus flavescens vividus.

2 ♂; 1 unsexed.

The common Bulbul of the re-growth and forests below 5,000 feet. Many young birds on the wing were seen.

***Pycnonotus jocosus* (Linn.).**

Common in re-growth and low forest up to 5,000 feet.

Pycnonotus flaviventris flaviventris.

1 unsexed.

The only bird seen, shot in re-growth at 4,500 feet, which must be near the upper limits of this species.

Certhia discolor shanensis.

1 ♂; 2 ♀; 1 unsexed.

Commonly seen both in the pine forests and also in evergreen from 5,000 feet upwards, but most often in the pines. The note is a shrill loud 'duwee-teet'. It is not a shy bird and appears so absorbed in its hunt for insects in the bark that it allows a close approach.

Pnoepyga pusilla pusilla.

1 ♂.

The only specimen seen. Was obtained in the undergrowth in evergreen near a stream at 6,000 feet.

Tesia cyaniventer.

1 ♀.

Obtained in the same place as *Pnoepyga* at 6,000 feet. It was uttering its characteristic shrill 'chirrup' which betrayed its presence.

[Recorded from Karen Hills and Mt. Byingyi but not before from Karenii. This specimen belongs to the form *olivea*.]

Brachypteryx cruralis.

3 ♂; 1 unsexed.

All the specimens were obtained in evergreen undergrowth at about 7,000 feet. No females of this species were seen, though 2 of the males shot were together.

Brachypteryx nipalensis nipalensis.

2 ♀; 1 unsexed.

Two specimens obtained in thick evergreen undergrowth near a stream at 5,500 feet and one in grasses in re-growth at 5,000 feet. No males seen.

[Hitherto Kalaw is the only locality where this species has been obtained between Bhamo in the north and Tenasserim in the south. I have already given reasons for uniting *Heteroxenicus* with *Brachypteryx* (*Ibis*. 1939, p. 349).]

Saxicola caprata burmanica.

Pairs seen along the road in re-growth at about 5,000 feet. No specimens obtained.

Rhodophilus ferrea ferrea.

2 ♀.

Common in the open pine forests up to 7,000 feet.

Hemicurus schistaceus.

1 ♀.

Shot in a stream at 5,000 feet in pine forest and found where the streams flow through rather open country, as opposed to evergreen.

[Though known from the Karen Hills this has not been recorded before from Karenii.]

Hemicurus leschenaultii indicus.

1 ♂.

These birds take the place of the Slaty-backed Forktail in the higher reaches of the streams above 6,000 feet where they run through evergreen.

[This also has not been obtained actually in Karenii before, though it has been in the neighbouring states.]

Chaimarrornis leucocephalus.

Birds seen in rocky streams at about 5,000 feet in several places. Undoubtedly breeds here. Two birds seen together at a big waterfall on the Mawchi road at 5,000 feet.

[A slight extension of range southwards from the Southern Shan States where it occurs.]

Calliope calliope.

A male seen in thick re-growth at about 4,500 feet.

Turdus obscurus obscurus.

1 ♀.

Specimen obtained out of a party of 15 to 20 birds feeding on ground in open oak forest at 6,000 feet. Also seen in evergreen. When approached all the birds flew swiftly up into the tops of the nearby trees with thin Pipit-like calls of 'zip-zip'. In habits this thrush resembles the Redwings and Fieldfares rather than the Gorund-Thrushes.

[I have already dealt with the question of *subobscurus* which Salvadori described from the Karen Hills (*Ibis*. 1935, p. 255). Wardlaw Ramsay obtained *feae* in Karenii and probably this and *obscurus* occur together in mixed flocks as winter visitors.]

Oreocincia dauma dauma.

1 ♂.

Obtained in oak forest at 6,000 feet, the only bird seen. It was working through the shrubs and lower branches 10 to 15 feet from the ground. The white wing bar is a good field character.

[Has been recorded in the Karen Hills.]

Zoothera marginata.

1 ♀.

Flew up into a sapling from the bed of a stream in which it was apparently feeding in evergreen at 5,000 feet. The only bird of its kind seen.

Monticola rufiventris.

A male bird seen, but not collected, in pine forest at 5,000 feet. Sat very erect and still on a dead branch high up in the crown of a tree. Observed clearly through the glasses for nearly half an hour.

Myophonus eugeni.

1 ♀.

Seen in several of the rocky streams in oak forest at 5,000 feet.

Hemicelidon sibirica fuliginosa.

3 ♀.

Shot just below the top of Nattaung at 8,500 feet in dwarf bamboo. Not uncommon in pine and oak forest at 5,000 feet. Partial to dead trees standing in clearings from which it hunts.

[Has been obtained in the Karen Hills as late as 26 April. The status is uncertain.]

Hemicelidon ferruginea.

1 ♂; 3 ♀; 1 unsexed.

A very common Flycatcher along the streams in evergreen between 5,000 feet and 7,000 feet, and also found in more open country.

[Has been obtained in Southern Shan States and Tenasserim, but not hitherto in Karen. Here again the status is uncertain as to whether it is a winter visitor or resident.]

Muscicapula hodgsoni.

1 ♂; 2 unsexed.

Found commonly in all types of forest between 5,000 feet and 8,000 feet. The male has a few (2 to 6) white feathers behind the eye on the sides of the crown.

Muscicapula hyperythra hyperythra.

1 ♂; 1 ♀.

Obtained near stream in evergreen about 6,000 feet and in temperate forest at 8,000 feet.

[The nearest locality to Karen that this bird has been obtained is the Southern Shan States. Status uncertain.]

Muscicapula melanoleuca melanoleuca.

2 ♂; 3 ♀; 1 juvenile.

Common in open oak and pine forest between 5,000 and 6,000 feet. The note is a thin high 'Pi-pi-pi-pi' followed by a low rattle 'churr-r-r-r-r' or 'Pi-churr-pi-pi-pi-pi'.

Muscicapula sapphira.

1 ♂.

In open pine forest at 5,000 feet. Another male was seen in thick regrowth at 5,000 feet.

[Does not appear to be common anywhere. It has been obtained in the Southern Shan States once or twice.]

Eumylas tha'assina tha'assina.

Seen on several occasions in re-growth at about 5,000 feet.

Culicicapa ceylonensis calochrysea.

Seen on numerous occasions up to 6,000 feet in all types of forest.

Niltava grandis grandis.

3 ♂; 1 ♀.

Seen and heard in many places up to 7,000 feet. It keeps to evergreen, particularly near streams and works the lower storey 10 feet to 50 feet from the ground. The note is most characteristic, a loud whistle of 3 notes on an ascending scale in a minor key.

[Not previously recorded from Karen, though it occurs as near as Mt. Byingyi in Loi Long State.]

Niltava macgrigoriae.

1 ♀.

Collected on stream bank on edge of hill cultivation in pine forest at 5,000 feet.

Chelidorhynx hypoxanthum.

1 ♂; 1 ♀; 1 unsexed.

Seen on several occasions in evergreen glades near streams at about 6,000 feet. It allows a close approach and flits about the branches, flirting out its tail like a Fantail Flycatcher. Two of the specimens were collected in temperate forest at 8,000 feet while courting.

[Recorded from the 'Toungoo Hills' by which probably was meant the Karen Hills near Thandaung.]

Rhipidura albicollis.

1 juvenile.

Several pairs seen at about 5,000 feet, and occasionally found up to 7,000 feet. It has a thin high-pitched whistle of 7 or 8 notes up and down the scale.

Lanius colluroides colluroides.

1 ♂.

Collected in pine forest at 4,500 feet, the only one seen.

Lanius nasutus tricolor.

1 ♂; 1 ♀.

Shot in re-growth at 4,500 feet where several birds were seen.

[The range of this species is still little known. It breeds at Kalaw and probably it breeds in Karen, whence it has not been recorded before, though it has been taken in the Karen Hills in April.]

Tephrodornis gularis pelvicus.

1 ♂.

Obtained in pine forest at 5,000 feet.

[Known from the Karen Hills but not hitherto from Karen. This single bird with wing 123 mm. is as large as any Burmese or Sikkim examples.]

Pericrocotus speciosus elegans.

1 ♂.

Seen once or twice at about 5,000 feet.

[This specimen is in the curious orange-red plumage sometimes found in Minivets. It is sexed as a male.]

Pericrocotus brevirostris.

3 ♂; 1 ♀.

The common Minivet of Nattaung, being found all over the open forest between 5,000 and 6,000 feet.

[Males from Karen measure wing 85-89.5 and are therefore somewhat intermediate between *affinis* (87-93 mm.) and *neglectus* (81-86 mm).]

Pericrocotus solaris.

3 ♀.

Collected in pine forest at 5,000 feet, the only birds of this race seen for certain.

[These appear to be very worn *solaris* though I cannot match them with any other specimens. At the same time *ripponi* does not appear to me to be a recognizable race as none of the specimens from the Southern Shan States either accord with the description or differ from *solaris*.]

Grae calus macei siamensis.

Common in the pine and oak forests, about 5,000 feet.

Artamus fuscus.

1 ♂.

Common up to 6,000 feet particularly on top of pine ridges.

[The ecology of this bird, which appears to have some relationship to palms, needs more careful working out. It is local and capricious for which there must be some cause. It is said to feed on butterflies, including 'noxious' ones, why, then, the massive bill? Recorded from Southern Shan States but not from Karen.]

Chaptia aenea aenea.

1 ♀.

Occasionally seen in valleys about 5,000 feet. Not seen on higher ridges.

Bhringa remifer tectirostris.

Seen on several occasions near the clearings for cultivation between 4,500 and 5,500 feet.

[Has been recorded from the surrounding districts but not from Karen.]

Tribura sp?

A bird making a 'tschik-tschik' note was heard in savannah on Sosiko at 7,000 feet, but refused to show itself.

Franklinia gracilis Hodgsonii.

1 ♂.

Seen in re-growth and grasses about 5,000 feet, and in paddy stubble and bushes.

Sclercurus burkii tephrocephala.

1 ♀; 1 unsexed.

Both obtained in oak forest at 6,000 feet, the only specimens seen.

[Not recorded before from Karen, but it is known from the Karen Hills.]

Phylloctetes cucullatus coronatus.

1 ♂; 1 unsexed.

A bird of dwarf bamboo brake, one specimen being obtained at 7,000 feet and the other at 8,500 feet. It has a very distinctive phrase of 4 notes, 4 times repeated each time about half an octave higher, the last so high as to be almost inaudible. 'Pee-pi-pi-pee' 4 times. The bird is most elusive. It has also a trilling little song, during which it flutters on a branch.

Phylloscopus pulcher pulcher.

3 unsexed.

Shot on top of main Nattaung ridge at 8,000 feet in dwarf bamboo.

[This Warbler has long been known in Southern Shan States and Karen in April, but we still do not know whether it is a winter visitor or a resident.]

Phylloscopus inornatus inornatus.

2 ♀; 2 unsexed.

Phylloscopus are common in the low trees throughout, and are one of the few genera seen in the dwarf bamboos on the final ridge at 8,500 feet.

Phylloscopus reguloides assamensis.

2 ♀; 2 unsexed.

Found in the same localities as *P. inornatus*.

[Judging by the condition of the plumage I should say that these, too, were breeding birds. Many have at one time or another met with both this species and with *davisoni*; as yet there is no record of what the songs and call-notes are like.]

Phylloscopus reguloides claudiae.

1 ♂.

[In contradistinction to the somewhat worn dress of *assamensis* this bird, which is, of course, a winter visitor to Karen, was in full body moult.]

Phylloscopus davisoni davisoni.

3 ♂; 1 ♀.

[This warbler is known to breed on Byingyi in March. Also at Kalaw and Thandaung and it certainly must have been breeding in Karen.]

Suya superciliaris superciliaris.

1 ♂; 2 ♀.

Obtained in re-growth at 5,000 feet and also in grass on open pine ridge at 6,000 feet. It has a strong shrill double note 'tu-wut, tu-wut'. Almost certainly nesting.

[Also known from the Karen Hills.]

***Oriolus chinensis* subsp.**

Seen on Mawchi road at 4,500 feet uttering a curious call 'Miaow' like a peevish cat.

Oriolus traillii traillii.

1 ♂.

Obtained in evergreen at 6,000 feet; one other was seen.

Carpodacus erythrinus roseatus.

2 ♀.

Seen in pine and oak forest on the edge of secondary growth at 5,000 feet, and a party of about six in female dress in pine forest at 6,000 feet.

Hypacanthis spinoides ambiguus.

1 ♂; 2 ♀.

A party in a cultivation clearing at 5,000 feet and seen on other occasions in pines at the same altitude keeping to the crowns of the trees. A distinctive, high-pitched thin call, 3 notes in quick succession followed by 4 notes in quick succession.

[Is known to breed at Kalaw and it occurs in the Myitkyina Hills. It must breed early as the specimen obtained on 8 April is a juvenile with fully grown wings.]

***Delichon urbica* subsp.**

A large flock was seen hawking insects over pine forest at 5,000 feet in the smoke of a forest fire. Probably on passage.

Motacilla cinerea melanope.

1 unsexed.

Fairly common on the Mawchi road at 5,000 feet, frequenting places where little streams jet on to the road. No other Wagtails seen.

[The question whether the Grey Wagtail nests in the Burmese hills is still unsolved. Known from the Karen Hills, but not before from Karen.]

Anthus hodgsoni hodgsoni.

4 ♀.

Very common in parties along the ridges in open pine and oak forest up to 7,000 feet.

[These belong to the Siberian form which is the typical race. Not previously from Karen, but is almost universally distributed in the non-breeding season in Burma.]

***Zosterops palpebrosa* subsp.**

1 ♀.

Obtained out of a pair in re-growth at 4,500 feet.

[*Zosterops mesoxantha* was described from Taho in the Karen Hills by Salvadori and this specimen is practically a topotype. It has a tinge of yellow down the middle of the belly as Salvadori describes. However, as I pointed out some years ago, such specimens are also found in Sikkim and elsewhere; otherwise Karen Hill and Karen birds do not differ from *palpebrosa* and a larger series is needed before the validity of *mesoxantha* can be admitted. Mr. Riley records what seems to be the same form as *cacharensis* and had also named it *vicina*. But if it is recognizable Salvadori's name has many years precedence. Mr. Riley states that I misled him by uniting *cacharensis* and *palpebrosa*. I had a large series of each for examination. He does not state how many he has examined from the type localities.

This is an interesting record for another reason. Recently Stresemann has suggested that *siamensis* is a race of *palpebrosa*; we now have *palpebrosa* from Karen whence Wardlaw-Ramsay obtained *siamensis*, so that here both forms are found together.]

Zosterops erythropleura.

1 ♂.

Shot out of a large party in pine forest at 5,000 feet. The pale lemon-yellow throat and undertail coverts and the chocolate flanks of this bird are distinctive. Has the same thin day-old-chick-like cheep of *Z. palpebrosa*.

[This is an interesting record as this White-eye has been obtained only once before in Burma. De Schauensee records it from Monglin in Kengtung, Southern Shan States on 13 February. Presumably it is a winter visitor.]

***Aethopyga nipalensis karenensis* Ticehurst (*Ibis*. 1939, p. 755.)**

4 ♂; 3 ♀.

The only Sunbird seen. It frequents both temperate forest, evergreen and open pine with rhododendron forest from 7,000 feet upwards, where it is common. Males predominate, the proportion seen being about 3 to 1.

[Birds from Myitkyina Hills and from Bhamo Hills belong to the typical form. The good series obtained on Nattaung, four males and three females, show that the type here is constant and easily separable from any other forms. There is in the male no maroon on the back and no scarlet splashing on the yellow breast and so they are widely separable from *nipalensis*. They are nearer *victoriae*; in this form the back is green with a very slight reddish tinge in it and there are splashes of red on the yellow of the underparts; in *karenensis* the back is brighter yellowish green with no red tinge and no scarlet on underparts. In addition the female is separable from both *nipalensis* and *victoriae* in having the whole crown slate-grey contrasting with the mantle instead of being concolorous with it; the underparts, too, are richer yellow.]

Arachnothera magna magna.

1 ♂.

Collected in oak forest at 6,000 feet. The only bird seen.

[It is of interest to find that the form in Karen is *magna* as no specimens thence were available before. Birds from Arakan and Southern Chin Hills are *magna*; on the east side of the Irrawaddy in Thayetmyo, in Tharrawaddy, Pegu and Toungoo the form is *aurata*. I had already noted that birds from Karen Hills are somewhat intermediate between *aurata* and *magna*, and now we find *magna* in Karen, as also in the Southern Shan States and N. Tenasserim. It seems that *aurata* is confined to the country between the Irrawaddy and the Sittang in Lower Burma.]

Dicaeum ignipectus ignipectus.

3 ♂.

Common in oak forest at 4,500 feet.

Psarisomus dalhousiae dalhousiaeOne bird seen in evergreen at 5,500 feet. No specimens obtained.
[Recorded from the Karen Hills.]**Picus chlorolophus chlorolophoides.**

1 ♂.

Obtained in oak forest at 6,000 feet. The only bird seen.

Dryobates atratus.

1 ♀.

Fairly common in open pine and oak forest between 5,000 and 6,000 feet.

Dryobates nanus.

1 unsexed.

Shot in pine forest at 6,000 feet.

[This single bird is unlike any others from Burma in having a very small bill. It is also very black on the upperparts, very dark on the crown, and the central tail feathers are without spots. Further material is desirable though single specimens from Kareni and the Karen Hills in the British Museum do not resemble it or differ from *canicapillus*. The form is highly variable and possibly this specimen is abnormal.]

Recently Mr. Deignan has resuscitated *pumilus* from S. Tenasserim as a valid form having browner upperparts as against black upperparts in *canicapillus*. In Burma brownness and blackness is due partly to individual variation and partly to wear. Of the large series at my disposal one can see that most fresh plumaged birds are black but some are blacker than others; in worn dress most acquire a more brownish tinge and this is irrespective of locality. It so happens that the only two from near the type locality of *canicapillus* (taken in February) are the brownest of a long series of Burmese birds. The race *pumilus* seems very doubtful and the amount of material from S. Tenasserim is not sufficient to be dogmatic that the form there is different to that of Lower Burma.]

Blythipicus pyrrhotis pyrrhotis.

Seen a 5,000 feet in oak forest. It has a harsh, strident call 'churra-churra-churra-churra'. No specimens obtained.

Megalaima virens virens.

Often heard in the valleys between 4,500 and 6,000 feet. It keeps to the tops of the highest trees.

[Is known from Southern Shan States, Karen Hills and the Papun District.]

Cyanops franklinii ramsayi.

1 ♀.

Common in both pine and evergreen from 4,500 feet to 7,000 feet. Not a shy bird, and allows a close approach. Often seen in low trees in the understorey. It has a loud double-note 'chu-uck, chu-uck'.

Cuculus canorus bakeri.

One bird heard calling at 6,000 feet in pine forest.

Cuculus micropterus micropterus.

Commonly heard up to about 6,000 feet.

[Recorded in Southern Shan States and N. Tenasserim.]

Hierococcyx sparvaroides.

Constantly heard up to 6,000 feet, calling most of the day, and apparently all the night.

Cacomantis merulinus querulus.

Occasionally heard at about 5,000 feet.

Chalcites maculatus maculatus.

1 ♂.

Shot in evergreen at 6,000 feet. The only bird seen.

[Is known already from the Karen Hills.]

Rhopodytes tristis longicaudatus.

Seen in re-growth at 5,000 feet.

Entomothera coromanda coromanda.

One bird seen in evergreen at 5,000 feet.

[Apparently a rare bird of which there are but few records outside Tenasserim. Recorded once at Kalaw in Southern Shan States and once in the Toungoo hills.]

Harpactes erythrocephalum erythrocephalum.

Several pairs seen in evergreen about 5,000 feet.

Hirundapus giganteus indicus.

Seen flying over the cleared top of Nattaung, 8,600 feet.

[The distribution of this Swift in Burma is little known. It has been obtained once in Karen.]

Caprimulgus macrourus bimaculatus.

Heard at 5,000 feet.

[Said to be the commonest species of Nightjar in the Southern Shan States. Not previously recorded in Karen.]

Glaucidium brodiei tubiger.

Heard at night at 4,500 feet and in pine forest at 6,000 feet at 8 a.m.

[Known from Karen Hills.]

Sphenocercus sphenurus sphenurus.

1 ♀.

One of a pair seen at 6,000 feet, the only ones seen.

[Is known from all the parts surrounding Karen.]

Ducula badia griseicapilla.

Occasionally seen upto 6,000 feet.

[The type came from the higher parts of Karen Hills.]

Streptopelia orientalis agricola.

Several seen on the road at about 4,500 feet.

Gallus bankiva robinsoni.

One cock calling in a valley at 5,000 feet, the only one heard. The locality should be rich in Phasianidae, but no Pheasants were seen, nor were scratchings noticed. They have undoubtedly been exterminated, with all four-footed game, by the Kares.

Arborophila rufogularis tickelli.

2 ♀.

Both obtained at between 7,000 and 8,000 feet in evergreen with sparse ground cover. A few scratchings seen at these elevations. Also seen in temperate forest.

[Recorded from Southern Shan States, Karen Hills and N. Tenasserim.]

Francolinus pintadeanus phayrei.

The call of this bird was heard once at 5,000 feet. No specimens collected.

Turnix maculatus maculatus

1 unsexed.

Obtained in grass in open pine forest at 6,000 feet. Seen on two other occasions at the same elevation in similar type of forest.

SMALL GAME SHOOTING IN MYSORE.

BY

MAJOR E. G. PHATHIAN-ADAMS, I.A. (*Retd.*), F.Z.S.

(*With a plate.*).

The Mysore District is the southernmost of the 8 districts which comprise the State and covers some 5,500 square miles of country at an average height of 2,500 feet above sea-level. On the south and west are extensive forests, but the greater portion consists of an undulating and well cultivated plateau with occasional bare stony uplands more or less covered with scrub jungle; while on the north-east large areas are under sugar-cane. The district is well watered by two large rivers and there are many tanks, some channel fed from the irrigation canals, but mostly dependent on the rains of the north-east monsoon. The latter tends to be irregular and in consequence the amount of water in most of the tanks varies from year to year; conditions for sport being most favourable when the monsoon has to a large extent failed and the duck and teal are congregated on the few tanks which do hold a sufficiency of water.

Mysore City, the headquarters of the district, lies some 86 miles by road south of Bangalore and 100 miles north of Ootacamund in the Nilgiris; and a radius of 40 miles from the city covers all the tanks and grounds which form the basis of this article on observations made from 1925 to 1939 and from the records in the game register covering that period.

Most of the numerous State Forests are Game Preserves where no shooting is permitted, so that for all practical purposes sport with the shotgun is confined to pigeons and migratory birds.

Snipe.—As in most parts of the plains of India the snipe is the most abundant and generally distributed of all game birds in the district, and though nowhere sufficiently numerous to lend themselves to record bags there are always sufficient to add variety to the bag and at time to afford by themselves an excellent day's sport. Anything over 25 couple in a day may be considered exceptional, the best recorded being 35½ couple to two guns.

The Pintail Snipe, as usual in South India, is considerably more numerous than the Fantail. It arrives as early as September and leaves about 15th April by which time it has mostly paired, though a few birds may stay on till early May. It is of course a considerably heavier bird than the Fantail averaging over 4 ounces as against the latter's 3½ ounces. Swinhoe's snipe were found for the first time during the past season, three being brought to bag; and they are therefore even more uncommon than in Malabar where their percentage works out at 1 to 280 Pintails as compared with 1 to 658 in Mysore.

The Fantail snipe generally arrives in October and is very locally distributed. They are on the whole wilder and their flight more erratic than Pintails, and consequently they are harder to bag than their more somnolent cousins.

Jack snipe are distinctly uncommon, but their numbers vary from year to year without any obvious reason, as in Malabar. For snipe shooting the writer has for many years used No. IX shot and finds that the closer pattern gives cleaner kills even at long range than No. 8, while experience shows that in an emergency the smaller size can be used most effectively on teal, always provided that shots are limited to birds approaching or crossing. Those who have not yet tried No. IX are strongly advised to do so.

For the table the snipe is deservedly prized, but how seldom one sees it served except roast on toast! Snipe are also excellent in a pie, or curried, while a thick snipe soup properly made with milk and a little onion is hard to beat; and an excellent potted meat can be made from them. A couple of years back one of our party had the extraordinary experience of finding a felt wad inside the snipe he was eating. One has found wads occasionally in rabbits shot at close quarters when ferreting and heard of them in pheasants and partridges, but the chances against one being found inside such a small bird as a snipe are so great that personally I should have found the incident incredible had I not been present at the table and seen our friend trying to dissect with his knife what he imagined to be an unusually tough 'trail'! The wad I may add is still in my possession.

The following table shows the different varieties of snipe shot during the past fourteen years:—

TABLE OF SNIPE SHOT.

Year	Pintail	Swinhoe	Fantail	Jack
1925-6	30	...	23	3
1926-7	38	...	21	1
1927-8	50	...	31	3
1928-9	46	...	9	1
1929-30	42	...	55	1
1930-1	180	...	49	3
1931-2	295	...	70	7
1932-3	219	...	43	2
1933-4	67	...	4	3
1934-5	129	...	80	6
1935-6	51	...	67	3
1936-7	118	...	71	6
1937-8	264	...	107	10
1938-9	334	3	156	12
Totals	...	1973	786	61

The Painted snipe not being a true snipe is not included in the above table, but 43 are recorded as having been bagged during the same period. Though not common, it seems to be fairly widely distributed. A nest with two eggs was found near Gundlupet on 6-8-1935, and several immature birds were shot in the same vicinity on 23-3-1938.

Geese.—The only goose found in the area is the Bar-headed, a considerably smaller bird than the Grey Lag of North India, but every bit as wary and incidentally excellent eating. Though nowhere common it is widely distributed, gaggles varying in number from half a dozen to 150 birds though the latter figure is exceptional. One favourite locality between Gundlupet and Chamrajnagar has afforded unusual opportunities for observation of a gaggle of over 100. Their custom is to assemble at dawn on a bare stony upland where an immense amount of gabbling takes place and the birds presumably secure grit. After about 15 minutes they break up into small parties which proceed in different directions to feed on the adjacent stubbles. About 9 a.m. they re-assemble in larger parties and fly in succession to the tank selected for the day's rest. Usually 1 or 2 scouts are sent ahead and then skein after skein arrives performing as they descend to the water the most amazing aerial acrobatics to the accompaniment of their usual clanging cry. By 9-30 all the parties have coalesced into one gaggle and soon all are floating peacefully asleep (except for the usual lookouts) in the centre of the tank.

Except where they can be stalked on the stubbles from behind bushes or walls, or from the bund of a small tank, they are difficult to approach and seldom allow a suspicious character to come within 150 yards. They can therefore best be brought to bag by studying their lines of flight which seldom vary and taking position accordingly. Bags are necessarily small and in the past 14 years only 28 have been collected, the best day being 8. They are tough birds and B. B. or No. 2 will be found the best size of shot. For cripple stoppers No. 7 does excellently as it gives a close pattern on head and neck; winged birds it may be added are adepts at diving and swimming under water.

Duck and Teal.—Of the *Anatidae* found in the district only the spotbill duck and the Whistling Teal are resident. All the rest are migratory and their dates of arrival vary to some extent from year to year, doubtless being affected by the amount of water available further North, but chiefly by the date of the setting in of the North-East monsoon current. Generally speaking they do not arrive in any numbers till about the middle of November, after which fresh arrivals may be expected till the end of December. By the middle of March all the duck have gone except for an occasional straggler and the resident Spotbills, but Garganey and Cotton Teal stay for at least another month.

Bags cannot of course compare with those obtained in the more favoured parts of North India and Burma. With us a bag of 490 duck and teal in a day to 4 or 5 guns is distinctly good, and it

is only in exceptional years (such as the season just ended) that this figure will be greatly surpassed, as the following list of red letter days shows:—

- 11 January 1926—24 duck, 15 teal and 6 snipe total 45 to 2 guns.
- 7 March 1935—52 duck and teal (mostly teal) in 2 hours to 1 gun.
- 14 March 1936—141 head including 102 teal and 21 blue rocks to 5 guns.
- 24 February 1939—30 duck and 75 teal (single tank) to 4 guns.
- 19 March 1939—187 head including 9 duck and 143 teal to 5 guns.

In 5½ days shooting during February and March 1939, 712 head were bagged by an average of 5 guns.

What sizes of shot are best? The writer finds that a No. 6 in the right barrel and an Alphamax No. 4 in the left will deal with any shots offered within reasonable range. For exceptionally high shots at duck an Alphamax No. 2 proves useful, and on account of its close pattern No. 8 is recommended for Cotton Teal.

Are duck decreasing in number? As regards Pintail, Garganey and Cotton Teal there does not appear to be any appreciable diminution in the past 14 years, but there is a definite and very noticeable decrease in the number of spotbills. Many of these birds nest in the district and suffer both from out-of-season shooting and also from their eggs being taken for food or sale by the villagers. The following table shows the numbers of duck and teal shot:—

Duck	Year	Pintail	Spotbill	Widgeon	Shoveller	Pochard	Tufted Pochard	White-eye	Brahminy	Gadwall
	1925- 6	4	32	..	4	..	..	..	..	..
	1926- 7	8	69	4	5	..	..	..	..	..
	1927- 8	5	34	1	19	..	..	..	..	1
	1928- 9	6	17	13	22	..	..	..	..	..
	1929-30	10	38	2	14	1	..	..	..	..
	1930- 1	24	31	..	4	1	2	..	..	..
	1931- 2	10	30	..	8	..	..	..	..	..
	1932- 3	3	33	..	3	..	..	..	..	..
	1932- 4	4	29	..	..	..	..	..	..	..
	1934- 5	17	34	..	13	4	1	..	..	..
	1935- 6	20	32	..	13	..	..	..	..	..
	1936- 7	12	37	2	5	2	1	..	..	..
	1937- 8	36	89	..	22	7	..	..	..	..
	1938- 9	10	60	2	44	22	3	1	..	..
	Totals ...	169	565	24	176	37	7	1	1	1

Teal	Year	Common	Garganey	Large Whistling	Lesser Whistling	Cotton
	1915- 6	3	23	...	...	10
	1926- 7	3	50	...	...	...
	1927- 8	1	39	...	3	2
	1928- 9	34	21	...	...	...
	1929-30	8	122	1	12	9
	1930- 1	4	69	...	5	34
	1931- 2	2	61	...	4	75
	1932- 3	1	43	...	7	26
	1933- 4	...	17	..	...	3
	1934- 5	27	114	...	...	64
	1935- 6	14	166	...	2	168
	1936- 7	11	87	...	19	153
	1937- 8	19	152	...	12	285
	1938- 9	20	291	...	10	531
	Totals ...	147	1,255	1	74	1,360

Note.—The bags till 1934 were mostly made by 1 or 2 guns, since then the size of the parties has increased to 4 or more guns. The figures given are therefore of interest chiefly as showing the relative proportions of the different species.

The following notes are appended on the various species:—

Pintail.—Large flocks, numbering anything up to 400 visit all the bigger tanks during the cold weather. When they first arrive in November and are still in small flocks they may often be stalked with success, but later on when they have amalgamated into larger flocks (generally of different sexes) no bird is warier, and if much disturbed, the first shot is sufficient to send them clear away to some quieter spot. As a table bird they rival the Spotbill in excellence early in the season, but their flavour appears to deteriorate later on and is then sometimes rather fishy.

Spotbill.—Though mainly resident their numbers are certainly increased by visitors during the cold weather. A few pairs may be found on most ready tanks throughout the year and at times flocks numbering 100 and more occur on the larger tanks especially late in the season. Apparently they breed twice in the year, as flappers unable to fly were found in October 1927, small ducklings in January 1931, and flappers again in February 1931—all in different localities. Oviduct eggs were found on 15th October and 24th November.

On the whole they are not very wideawake birds and often offer easy shots, but wounded birds are expert divers and difficult to retrieve especially in lotus covered tanks. They are first class eating.

Widgeon.—An uncommon winter visitor, their numbers varying greatly from year to year; in fact several years may pass without a single one being seen.

Shoveller.—A few birds are generally to be found on most tanks in the cold weather, and at times flocks up to a dozen or more

occur. I do not consider that this bird is a dirty feeder in Mysore, however bad he may be in the North, at any rate as a rule. They are generally found on clean tanks (not on village ponds) and feed on the surface of the water going round in small circles with head down and bill open to skim the surface; often found in company with a few teal.

Provided they are skinned and not plucked they are by no means bad eating.

They are not very wary birds and often give easy shots.

Pochard.—An irregular winter visitor, but by no means as rare as indicated in *Birds of South India*. The largest flock I have seen was estimated by members of our party to number from 300 to 400. This was in January 1938 on a tank near Bannur—on which occasion five were brought to bag and several lost.

Once off the water they generally afford a number of chances as they circle the tank but soon gain height (generally in dense formation) and clear right off.

As a table bird not bad eating, but not to be compared with the Spotbill or Pintail.

Tufted Pochard.—A somewhat rare winter visitor. On one occasion from a flock of 15, 2 were bagged and 3 lost—the others recorded were single birds.

Wounded birds swim fast and low in the water and are such expert divers that they are extremely difficult to retrieve. In flight when seen from below they look like large cotton teal. A poor bird for the table.

White-eye and Gadwall.—Single records.

Brahminy.—Not common. The most seen were 20 on a sandbank in the Cauvery River. If skinned the breast can be made quite palatable.

Comb duck.—None bagged, but 2 definitely recorded as seen near Gundlupet. Theobald's record of it from Kollegal no doubt refers to the Yellandur tanks in Mysore which I am informed were favourite shooting grounds of his. My recollections of it from Burma are that it was not a good bird for the table.

Common Teal.—Not common and seldom found in flocks of over 20, being more abundant some years than others. An excellent bird for the table, far better in my opinion than the garganey.

Garganey.—The commonest duck in Mysore outnumbering even the Pintails and Cotton Teal, the flocks varying from 25 to 200 or more. Fairly easily brought to bag except when wounded. A good table bird except late in the season when it is inclined to be fishy.

Large Whistling Teal.—Only recorded once when a single bird was obtained from a small flock on the Cubbany River behind the Travellers Bungalow at Nanjangud.

Lesser Whistling Teal.—A common resident generally found on weedy tanks and sometimes on rivers, and fairly distributed throughout the district. Flocks number from under a dozen to 100 or more. On the water they are not particularly wary and may often be stalked; once in the air they circle round and round the tank uttering their noisy whistling cry and keeping at a fair height, but sooner or later

come within range if the gun is well concealed. Wounded birds are expert divers and difficult to recover in the reed and lotus covered tanks which they generally frequent.

I have found their nests on islands in the Cauvery in August, and saw no less than 25 pairs on a tank near Gundlupet in June. Two old birds with 7 ducklings were seen on a roadside tank near Hampapura on 21-12-1932 and I have a record of ducklings from another locality on 13-12-1936. Their breeding season therefore appears variable unless they are double brooded.

If skinned it is quite a fair table bird, and I think I am correct in stating that in Ceylon it is considered better eating than other teal.

Cotton Teal.—Common throughout the district in flocks of from 5 to 200. A few certainly stay throughout the year as I have repeatedly seen as many as 15 pairs in July, but the great majority must be migrants. It is a fairly confiding bird and difficult to rouse from the water, and then at first is inclined to bunch. But when once it is really roused it gives most sporting and difficult shots as its pace is so easily misjudged. A common habit after firing has become general is for a flock to leave the tank, circle across country and then return to the water; as they flash past in this way at breast height they give a wonderfully good imitation of driven grouse and are equally hard to hit. With such a small bird No. 8 shot will be found to give the best results—larger shot often results in a bird being winged and a winged cotton teal is generally lost, as they will stay under water for anything up to 3 minutes.

It is quite a mistake to suppose that these birds are unfit for the table—on the contrary, they are excellent eating.

Demoiselle Crane.—Flocks totalling several thousands visit the Cubbany River above and below Nanjangud annually from about 20th December when they may be heard circling Mysore city at night on arrival, and they stay till March. They feed on the paddy stubbles in the morning and evening, and pass the rest of the day and the night on sand-banks in the river. The only other places where I have seen them is on the Yellandur tanks and at the junction of the Cauvery and Cubbany Rivers at T. Narsipur.

They are not particularly difficult to bring to bag but are tough birds, and large size shot is recommended. Wounded birds are apt to be aggressive and should be approached with caution. Before they leave in March they indulge in extraordinary antics on the sand-banks. Their harsh clanging cry is responsible for their local name of Kara Kara. A first class bird for the table.

Pigeons.—Of other game birds Green Pigeons afford the most sport. They are common and widely distributed during certain months, being found in flocks of up to 50 and more feeding morning and evening on the fruit of the banian trees which line most of the main roads. Their greatest frequency occurs from October to February after which their numbers decrease and from March onwards only a few odd birds are to be seen. The large numbers seen in pairs and presumably nesting during May and June in the Mudumalai forest and at the foot of the Northern slopes of the

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SMALL GAME SHOOTING IN MYSORE.



Demoiselle Cranes.



A halt for lunch.

Nilgiris doubtless come from Mysore and return there later. The South Indian green pigeon is commonest, but considerable flocks may be found of the Grey-fronted whose swifter flight and smaller size generally identifies them on the wing. Only 2 Orange-breasted green pigeons have been shot during the past 14 years both near Gundlupet, and on each occasion they were in company with the South Indian species.

They are excellent sporting birds and not difficult to bring to bag, No. 7 shot having been found the most useful size. Up to 40 a day may be expected to 2 guns. For the table they are equally good especially if skinned before cooking.

Of other pigeons the Ceylon Green Imperial occurs in small numbers and the Blue-rock is common. The latter is generally found about old bridges and temples. The Wellesley bridge at Seringapatam is a well-known locality, our best bag being 63 to 3 guns one evening as the birds came in to roost. I have met the Nilgiri wood pigeon only once in this area when 2 were shot out of 4 seen in scrub jungle some 5 miles west of Begur.

Sandgrouse.—Both Common and Painted are found in the district but they are uncommon and strictly local. Personally I know of only one locality where over 100 come to water at a small tank about 9 a.m. in the cold weather, the best bag being 22, but there are other suitable areas which no doubt hold them. I have found their nests in March and April—the average clutch being 2. Only one painted sandgrouse has so far been brought to bag out of a pair found near Nagamangala.

Great Indian Bustard.—As this is a rare bird in all parts of its habitat, a more detailed account of the 3 I have bagged may be of interest. The first occasion was in December 1929 when I was returning across country after shooting a duck tank. Our way was along the slope of a small hill covered with thorn bushes and low scrub, and as we topped a ridge I saw 2 large birds on the ground about 50 yards away, pecking about. They looked like a cross between a vulture and a peacock, and it was not till they took to flight a moment later that I realized what they were. As they had only flown some 200 yards down into a small valley full of bushes I sent my 3 men round to the right to drive them while I ran down to the left to try and intercept their probable line of flight. One came past about 50 yards away and a charge of B. B. brought it down—the other rose well out of shot and we watched its steady flight for over a mile till it disappeared behind a hill. The one shot was a magnificent bird and weighed 25 lb. Its stomach contained some crystal stones and a number of large red grasshoppers, with a brown mush presumably consisting of grass tips; it proved excellent eating. The second was one of those lucky chances which occur to every sportsman at times. It was a chance encounter in 1931 round a bush at only 30 yards, and a charge of No. 6 shot with which I happened to be loaded killed the cock dead on the spot.

On the third and last occasion a year later I visited the same spot, a rolling stony upland covered with short bushes, and after

some spying with the fieldglasses spotted the long white neck of a cock watching us over a bush about 500 yards away, while further examination of the ground showed 4 more in its vicinity. A big detour and a stalk up a convenient nullah brought me within 120 yards when a solid bullet from my .318 at the base of the neck laid low a bird whose suspicions had been aroused and which was staring at the bush behind which I was sheltering. The remainder flew off about half a mile and I spent another hour trying for another shot but without success. The only other record I have is of a cock seen flying as recently as January 1938.

These birds are already rare and unless steps are taken to give them complete protection both from sportsmen and from the professional snarers, as already suggested in the Survey of wild life in Mysore, their extinction is only a matter of time.

Other game birds which may be met with are the following:—

Florican.—I have only seen one in the past 14 years, some 30 miles north of Mysore City; so presumably it is a rare bird.

Peafowl.—Formerly common round Gundlupet and no doubt in other suitable localities, but though protected by the Game Laws it has much decreased in recent years owing to village poaching.

Grey Jungle Fowl.—Common and widely distributed in suitable localities, but suffers much from the depredations of professional snarers.

Spur Fowl.—The Red Spur Fowl is less common than the preceding, but I have shot a few round Gundlupet. Only one painted spur fowl is recorded from the same locality.

Southern Grey Partridge.—Common and widely distributed but suffers even more than the Jungle Fowl from the activities of the Pardies who snare immense numbers annually apparently without any restriction of season.

I have found only 2 nests of this bird both in July. Not a bad bird for the table though somewhat dry; but as it is a dirty feeder at times, the crops of any birds shot in the vicinity of villages should be examined before they are given to the cook.

Quail.—These are occasionally put up when snipe shooting, the Rain Quail being more common than the Grey of which I have only one record at Gundlupet. Other varieties include the Rock bush quail and the Button, but they are seldom considered worth a charge of shot.

With the exception of the hare which is seldom seen that ends the list of small game, but a few notes on shooting may be of interest.

Snipe are of course shot walking in line, but if very wild may sometimes be driven with success. In shooting a tank it is important that all guns should be in place before the rousing shot is fired and cover is most necessary. When there are tall reeds these prove ample, but often the shore is bare when a hide must be constructed out of branches or by wire netting supported on light poles with grass plaited into the mesh; the latter is a light and portable type and has proved extremely useful. A couple of decoy ducks placed in the water about 30 yards from the gun bring one a number of extra chances, Spotbills and Garganey being especially attracted. On

p. 167, Vol. XIV of the *Journal*, is an interesting note on the use of a pariah dog to decoy duck in Mysore, but I have never heard of one being used in this way. A trained shooting dog is however most useful to retrieve ducks, but care should be taken never to allow one to enter a tank in which there are known to be crocodiles or where the weed is very heavy. In the latter case a light folding boat which can be carried on the car and quickly put together, is the only method which can be used with safety, as it is unthinkable to allow a cooly to make the attempt however willing he may be.

As regards dress, a green shikar coat with khaki shorts, putties and hobnailed boots are probably best in the long run. Stockings and shoes are more comfortable but the former are little protection against water leeches which abound in some tanks, while the latter soon get filled with mud. A drawback to shorts is the water itch which is particularly bad at times, but this can be avoided by smearing the knees with carbolised vaseline before entering the water. Water itch is noticeably worse in or near a bed of bull rushes, but I have been unable to ascertain its cause, though a small waterflea has been suggested.

The subject of cartridge average is always of interest and the question is often debated as to what expenditure of cartridges constitutes a good shot. Conditions of ground, light and weather vary so from day to day that only the season's average should be considered, and I think a good all round shot taking every reasonable chance should average not less than 50% at snipe and pigeons and 33½% at duck and teal, counting only those birds which are actually picked up.

Too much importance should not however be placed on cartridge averages or they may spoil a man's sport. One has met men whose reputation as snipe shots, etc. was founded on the fact that they picked their birds, and never fired at one over 25 yards away, considering anything over 30 yards as hopelessly out of range. Such shooting to the average is not conducive to sport nor to a big bag, and anyone who suffers from such a complex is advised to discontinue counting his kills to cartridges.

In conclusion, any sportsman visiting Mysore between November and March should certainly bring a shotgun, as the small game shooting though nothing great, is at least very enjoyable.

ACHROIA GRISELLA FABR. AND ITS STATUS IN
SOUTH INDIA.

BY

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AND

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INTRODUCTION.

The occurrence of *Achroia grisella*—the lesser wax-moth—was till recently supposed to be restricted to the western countries and information regarding its status as a pest on honey combs has been somewhat contradictory. To mention a few, Prof. Dr. A. Borchert, in his article, 'Wax-moths and their control', page 374, *American Bee Journal*, August 1938, appears to take a serious view of this pest, while F. B. Paddock in 'Bee Moths', page 422, *Journal of Economic Entomology*, vol. xxiii, 1930, states that it comes only as a scavenger after an attack of *Galleria mellonella*. In North India, C. C. Ghosh makes the first record of this pest on page 24 of *Miscellaneous Bulletin*, No. 6—Bee-keeping—of the Imperial Council of Agricultural Research, 1936 and states the following: 'There is a smaller moth known as the lesser wax-moth—*Achroia grisella* F. 'which is a smaller enemy of combs but to a much less extent than the wax-moth'.

STATUS OF THE PEST AT COIMBATORE.

At Coimbatore, the pest was for the first time noted by the authors in November 1936 causing some minor damage to stored combs. The damage caused by the caterpillars to the combs in bee colonies is practically negligible as compared with the ravages of *Galleria mellonella*. In nature the caterpillars are generally found feeding on the debris accumulated on the floor board of the artificial hive.

DESCRIPTION OF THE ADULT.

The following description is given in page 6—*Fauna of British India, Moths*, Hampson, Vol. iv.

Genus—*Achroia*.

Achroia, Hubn Verg, p. 163 (1818).

Type, *A. grisella* Fabr.

Range—Palaearctic, Oriental, and Australian regions.

Palpi minute and porrect; maxillary palpi minute; frons rounded; antennae minutely serrate; tibia roughly scaled. Forewing short and rounded; male with a glandular fold fringed with hair at base of costa below; vein 3 from near angle of cell; 4, 5 stalked; 6 from below the upper angle; 7, 8 stalked; 9 stalked with 7, 8 from cell or abnormally absent; 10 from cell; 11 absent—

hind wing with apex acute; vein 2 from close to angle of cell; 4 absent; 3, 5 stalked; 6, 7 stalked; 7 anastomosing with 8 to near apex.

Achroia grisella Fabr. *Ent. Syst.*, iii, pt. 2., p. 289.

A. cinereola; Hubn. *Samml. eur. Schmett.*, *Bombyces*. Fig. 91.

Uniform grey brown; the head yellow.

The larva feeds on the wax in bee hives.

Hab. Europe, Calcutta, Australia, Exp. 18-20 mm.

HOW TO DISTINGUISH THE LARVAE OF THE TWO WAX-MOTHS.

Occasionally caterpillars of *Galleria* and *Achroia* are found in close association on the combs of neglected bee colonies, but caterpillars of the bigger moth can be easily made out by their bigger size, stouter build and greyish colour. Apart from the size and colour, the two pests can be differentiated by their feeding habits which are peculiar to each. Caterpillars of the bigger moth feed voraciously on the combs after having established themselves near the central partition and constructed the tortuous silken feeding tunnels. The infestation is noticed by the presence of a whitish silken webbing over the cells and in bad cases the whole comb is eaten away leaving behind only a tangled mass of webbing which is generally white and free of any dirt or excreta. In the other case the caterpillars feed mostly on the surface hiding inside silken galleries which are completely covered by the dark pellets of excreta that adhere to it, giving it an almost brownish or even a dark colour. Besides these differences in the feeding habits, the following few variations on the external structure of the two caterpillars may also be mentioned.

Galleria mellonella

1. The full grown caterpillar is nearly 2.5 cm. in length, stout bodied. Pale dark in colour. Body segments thickset over the abdominal region 1-6, the two end regions tapering.
2. Head and prothorax dark brown.
3. A longitudinal whitish streak over the prothorax is prominent.
4. The adfrontal area between front and epicranium is dark brown and clearly demarcated.
5. Between the adfrontal area and the epicranial shield, there is a prominent brownish yellow thick line.
6. The body setae are more brownish and arise from small elevated, circular blackish warts.
7. In segment 9 (abdominal) four setae lying on the dorsal side and two on either side of the median dorsal line are seen on a plate like chitinised area,

Achroia grisella

The full-grown caterpillar 1.6 cm., slender, pale whitish in colour. Body almost cylindrical and smooth over the greater portion except at the extremities which are slightly thinner.

Head and prothorax light reddish.

The streak is faint and narrow.

The portion of the epicranium towards the centre, the adfrontal area and the front are of uniform light brownish tint.

The outer boundary of the adfrontal area is very feebly indicated as a thin line.

The body setae are softer and no conspicuous warts or tubercles present. The base of the setae are less chitinised.

No special chitinised plate or area on the 9th abdominal segment.

LIFE HISTORY OF THE MOTH.

The moths copulate soon after emergence and remain in copulation for about 10 or 15 minutes. Oviposition takes place on the same day. The eggs are laid in small groups but not glued with one another, generally hidden under the broken fringes of the combs or in cracks and crevices of the receptacle. The eggs are roughly spherical in shape, less than 1 mm. in size and pale white in colour. The maximum number laid by a single female was 186 and the bulk of them are laid within the first three days after copulation. Eight other moths laid 184; 153; 112; 110; 103; 94; 88; and 73 eggs respectively. The egg period lasts from 2 to 4 days. The newly hatched larva is fairly active, about 2 mm. in length, lightly pubescent with the head capsule coppery brown in colour. The tiny caterpillars burrow into the combs and feed on them constructing the characteristic silken tunnel covered with their excreta. The larval period lasts from 34 to 38 days after which the caterpillar pupates inside a silken cocoon completely covered with their excrement. The latter is generally found amidst the debris but in rare cases it is also be found on the sides of the receptacle. The pupal period lasts from 5 to 12 days after which the adults emerge. The longevity of the moths is not high, the maximum being 8 days.

THE PEST AND ITS ASSOCIATION WITH THE BRACONID—
Apanteles galleriae.

As already mentioned, the caterpillars are generally seen gathered on the floor board of the artificial hive. The Braconid appears to parasitise these freely and numbers of their cocoons are often found in the debris, which indicate that the pest is, to a considerable extent, kept in check, by the parasite. The material collected from the floor boards of individual hives was kept separately under observation and in all the cases observed, only adults of either the lesser wax-moth or the braconid parasite emerged. This is another proof to support the statement that most of the caterpillars found on the floor board are those of *A. grisella*.

The parasite lays its eggs singly inside the caterpillar and the grubs on hatching out feed on the host and when mature, come out and construct cocoons and pupate inside them. The full grown grub is plump with the body tapering towards the head and pale yellow in colour. The total life cycle ranges from 16-22 days. The parasite is capable of reproducing parthenogenetically. The average longevity of the male and female is 14 and 11 days respectively.

CONTROL MEASURES.

As the caterpillars are generally found on the floor board, frequent cleaning of the board would keep the hives free of this pest. In cases where the stored combs are attacked, drying of the attacked combs in the morning sun for about 5 minutes (temperature in the open not exceeding 95-100°F.) would drive out the caterpillars when they can be killed.

THE MEDICINAL AND POISONOUS COMPOSITES OF INDIA.

BY

J. F. CAIUS, S.J., F.L.S.

The COMPOSITÆ are found in all parts of the world, spread all over the warm and temperate regions, and extending even into the colder ones. They are herbs or shrubs, sometimes assuming arborescent forms in warm countries. This family far outstrips all others in the number of genera in the order, and the number of species in the genus. More than a tenth of all the species of flowering plants belong to this family, which includes about 900 genera and over 13,000 species.

Bitterness is the prevailing characteristic of the plants which compose the Order. Therapeutically these may be divided into two groups:—(1) the *Tubulifloræ* which are generally bitter, tonic, stimulant, and astringent, and in many instances diaphoretic, diuretic, and laxative; (2) the *Ligulifloræ* which are milky, bitter, astringent, and sometimes narcotic.

The following are among the substances isolated:—(1) *hydrocarbons*—cadinene, dipentene, d-limonene, phellandrene, pinene—; (2) *alcohols*—cineol, borneol, mannitol, terpineol, thuyol—; (3) *phenolic ethers*—anethol—; (4) *acetones*—camphor, thuyone—; (5) *acids*—aconitic, alantic, angelic, caproic, carthamic, gallic, lactucic, nonylic, tiglic—; (6) *esters*—pyrethrins—; (7) *sugars*—glucose, laevulose—; (8) *starches*—inulin—; (9) *resinoids*—senecin, lactucopicrin—; (10) *glucosides*—absinthin, anthemic acid, arnicin, centaurein, cyanin, eupatorin, gaultherin, inulin, lactucenin, lactucin, moschatin—; (11) *alkaloids*—abrotine, achilleine, echinopseine, β -echinopsine, echinopsine, lobelanidine, lobelanine, isolobelanine, lobelidine, lobeline, moschatine, senecifolidine, senecifoline, senecine, senencionine—; (12) *miscellaneous drugs*—absinthiin, pyrethrin, santonin—.

The medicinal and poisonous Composites of the world belong to 196 genera:—*ACANTHOSPERMUM* (Hawaii, Singapore; Brazil); *ACHILLEA* (cosmopolitan; temperate northern regions); *ACHYRACHAENA* (Western North-America); *ACTINOMERIS* (North America); *ADENOSTEMMA* (cosmopolitan); *AGERATUM* (cosmopolitan, throughout the Tropics); *AMBROSIA* (Mediterranean region; America); *AMPHIDDOXA* (southern and tropical Africa); *ANACYCLUS* (Mediterranean region); *ANAPHALIS* (cosmopolitan; Asia, America); *ANTENNARIA* (cosmopolitan, in mountains); *ANTHEMIS* (cosmopolitan); *APLOPAPPUS* (Chile); *ARCTIUM* (temperate Asia, Europe); *ARNICA* (Europe, Asia, North America); *ARTEMISIA* (cosmopolitan; northern temperate regions, South America); *ASPILIA* (tropical Africa; Madagascar; Mexico; South America, chiefly Brazil); *ASTER* (cosmopolitan, northern temperate regions); *ATHANASIA* (South Africa); *ATHRIXIA*

(Arabia, southern and tropical Africa, Madagascar, Australia); ATRACTYLIS (Mediterranean region; China, Japan); BACCHARIS (cosmopolitan; tropical America); BELLIS (cosmopolitan, northern hemisphere); BERKHEYA (South Africa); BIDENS (cosmopolitan, chiefly American); BIGELOWIA (northern and central America); BLEPHARIPAPPUS (western North-America); BLUMEA (tropical and subtropical Asia, Africa, Australia); BOJERIA (tropical Africa, Madagascar); BOLTONIA (northern subtropical Asia, North America); BRACHYCLADOS (Argentina, Patagonia, Chile); BRACHYLAENA (South Africa); BRICKELLIA (North America, Mexico, Brazil); CALEA (America, Jamaica, China); CALENDULA (cosmopolitan; northern Africa, southern Europe, western Asia); CALLILEPIS (South Africa); CARBENIA (Mediterranean region, Caucasus); CARDOPATIUM (Mediterranean region, North Africa); CARDUUS (cosmopolitan; temperate Europe, North Africa and Asia); CARLINA (Mediterranean region; Siberia, Canary Islands); CARPESIUM (Europe; temperate and subtropical Asia); CARTHAMUS (Mediterranean region, Central Europe, India, Abyssinia, Canary Islands); CENIA (South Africa); CENTAUREA (cosmopolitan; Europe, America, western Asia, Australia); CENTIPEDA (Asia, Australia, tropical South America); CENTRATHERUM (Asia, Australia, America); CHONDRILLA (Mediterranean to India; Siberia); CHRYSANTHEMUM (cosmopolitan, northern temperate regions); CHRYSOCOMA (Caucasus, Siberia; Egypt, Arabia; South Africa, South America); CICHORIUM (cosmopolitan, temperate regions); CINERARIA (Europe, South Africa); CLIBADIUM (Central and South America, West Indies); CNICUS (northern temperate regions); COLEOSANTHUS (Bolivia); CONYZA (tropical and subtropical regions); COTULA (tropical and temperate regions); CREPIS (cosmopolitan; northern temperate regions); CROSSOSTEPHIUM (Central Asia, China, Luzon); CYNARA (Mediterranean region, Canary Islands); DAHLIA (cosmopolitan; Mexico, Central America); DICHROCEPHALA (Asia, Africa, Madagascar); DICOMA (South Africa, India); DIMORPHOTHECA (South Africa); DORONICUM (temperate Europe and Asia); ECHINACEA (North America); ECHINOPS (cosmopolitan); ECLIPTA (cosmopolitan, tropical); ELEPHANTOPUS (cosmopolitan, chiefly tropical American); ELYTROPAPPUS (South Africa); EMILIA (India, tropical Africa, Madagascar); ENHYDRA (tropical and subtropical regions); EPALTES (tropical Asia, Africa, America); ERECHTITES (America, Australia, New Zealand); ERIGERON (cosmopolitan; northern temperate region); ERIOCEPHALUS (South Africa); ETHULIA (India, Sunda Archipelago, Java, eastern tropical Africa, Madagascar); EUPATORIUM (cosmopolitan, chiefly American); EURYOPS (South Africa); FAUJASIA (Mascarene Islands); FELICIA (southern and tropical Africa); FILAGO (Europe, North Africa, Argentina, Paraguay); FLAVERIA (Central and South America, Australia); GAMOLEPIS (South Africa); GARULEUM (South Africa); GAZANIA (South Africa); GEIGERIA (South Africa); GERBERA (cosmopolitan; temperate regions and mountains); GLOSSOCARDIA (India); GLOSSOGYNE (tropical Asia, Australia, New Zealand); GNAPHALIUM (cosmopolitan); GONGROTHAMNUS (tropical Africa); GRANGEA (tropical Asia and Africa); GRINDELIA (North and South America); GUIZOTIA (tropical

Africa); *GYMNOisperma* (Mexico); *GYNURA* (warm regions of Asia, Australia, and Africa); *HAPLOCARPHA* (South Africa); *HELENIASTRUM* (Chile); *HELENIUM* (North America); *HELIANTHUS* (America, mostly North America); *HELICHRYSUM* (cosmopolitan; temperate and subtropical regions); *HEMIZONIA* (California, Galapagos); *HERDERIA* (tropical Africa); *HIERACIUM* (cosmopolitan); *HYPOCHOERIS* (temperate regions and mountains; Europe, northern Asia, Mediterranean region, South America); *HYSterionica* (Western America, Chile); *INULA* (cosmopolitan; Europe, Asia, Africa); *JURINEA* (Europe, Western and Central Asia); *LACTUCA* (cosmopolitan; northern temperate regions); *LAGGERA* (Asia, tropical Africa); *LAMPRA-CHIAEUM* (India); *LASIOSPERMUM* (South Africa); *LAUNAEA* (Europe, Canary Islands; South and North Africa to India; West Indies); *LEONTONYX* (South Africa); *LEYSSERA* (Mediterranean region, South Africa, North America); *LIATRIS* (North America); *LYGODESMIA* (western North America); *MACROCLINIDIUM* (Japan); *MADIA* (Chile, North America); *MALACOTHRIX* (North America, California, Mexico); *MATRICARIA* (cosmopolitan); *MELANTHERA* (Bahama, Yucatan); *METALASIA* (South Africa); *MICROGLOSSA* (Asia, Africa); *MICROSERIS* (South America, New Zealand); *MIKANIA* (cosmopolitan; America); *MONOLOPIA* (California); *MONTAÑOA* (cosmopolitan); *NIDORELLA* (southern and tropical Africa, Abyssinia, Cape Verde); *NOLLETIA* (Africa); *NOTONIA* (India, Burma, Abyssinia, tropical Africa); *ONOPORDON* (Mediterranean region, Europe); *ONOSERIS* (Mexico, South America); *OSMITES* (South Africa); *OSMITOPSIS* (South Africa); *OSTEOSPERMUM* (Africa); *OTHONNA* (cosmopolitan; South Africa); *OTHONOPSIS* (Africa, Asia); *PARTHENIUM* (North America, Mexico); *PECTIS* (America, West Indies); *PEGOLETTIA* (Java; southern and tropical Africa); *PENTZIA* (South Africa); *PEREZIA* (Mexico, South America); *PETASITES* (northern temperate regions); *PEUCEPHYLLUM* (western North America); *PICRIDIUM* (Europe, Western Asia, North Africa); *PICRIS* (cosmopolitan; Mediterranean region, Europe, Abyssinia, temperate Asia); *PIGUERIA* (Mexico, Ecuador, Peru, Chile); *PLEIOTAXIS* (tropical Africa); *PLUCHEA* (tropical and subtropical regions); *POLYMNIA* (America); *PRENANTHES* (northern temperate regions); *PRINTZIA* (South Africa); *PSIADIA* (Arabia, tropical Africa, Mascarene Islands, Madagascar); *PTERONIA* (cosmopolitan); *PULICARIA* (cosmopolitan; Europe, Asia, Africa); *RUDBECKIA* (cosmopolitan; North America); *SANTOLINA* (cosmopolitan; Mediterranean region); *SAUSSUREA* (northern temperate regions, and mountains); *SCHISTOSTEPHIUM* (South Africa); *SCLEROCARPUS* (tropical Africa, North America, Mexico); *SCOLYMUS* (Mediterranean region, Nubia, Caucasus); *SCORZONERA* (Central and South Europe, North Africa, Asia); *SENECIO* (cosmopolitan; temperate climates, mountains of the tropics); *SERRATULA* (cosmopolitan; Europe, North Africa; western, central, and alpine Asia); *SIEGESBECKIA* (cosmopolitan; tropics and subtropics; Peru); *SILPHIUM* (North America); *SILYBUM* (Mediterranean region; Europe, North Africa, northern India); *SOLIDAGO* (North America; northern temperate regions); *SONCHUS* (cosmopolitan; northern temperate regions, Central Asia); *SPARGANOPHORUS*

Australia); *SPILANTHES* (tropical America); *STENOCLINE* (Madagascar, Brazil); *STOEBE* (South Africa); *SYNEDRELLA* (tropical America, Africa, Asia); *TAGETES* (cosmopolitan; Argentina to Arizonal); *TANACETUM* (north temperate regions); *TARAXACUM* (temperate and cold regions); *TARCHONANTHUS* (Africa); *TRAGOPOGON* (Mediterranean region; Europe, North Africa, temperate and subtropical Asia); *TRICHOLEPIS* (India, Afghanistan); *TRILISA* (North America); *TRIPLOTAXIS* (tropical Africa); *TRIPTERIS* (South Africa); *TRIXIS* (America); *TUSSILAGO* (cosmopolitan; northern temperate regions); *URSINIA* (cosmopolitan; South Africa); *VENIDIUM* (southern and tropical Africa); *VERBESINA* (tropical America); *VERNOMIA* (cosmopolitan, chiefly tropical; mostly American); *VOLUTARELLA* (southern Europe, North Africa, western Asia, India); *WEDELIA* (tropical and subtropical regions); *WYETHIA* (western North America); *XANTHIUM* (cosmopolitan; Indo-Malaya, America); *XERANTHEMUM* (Mediterranean region to the East; South Africa).

The medicinal and poisonous Composites of India belong to the following 80 genera:—*ACANTHOSPERMUM*, *ACHILLEA*, *ADENOSTEMMA*, *AGERATUM*, *ANAPHALIS*, *ANTHEMIS*, *ARCTIUM*, *ARTEMISIA*, *ASTER*, *BIDENS*, *BLUMEA*, *BOLTONIA*, *CALENDULA*, *CARDUUS*, *CARPESIUM*, *CARTHAMUS*, *CENTAUREA*, *CENTIPEDA*, *CENTRATHERUM*, *CHRYSANTHEMUM*, *CICHORIUM*, *CNICUS*, *COTULA*, *CREPIS*, *DICROCEPHALA*, *DICOMA*, *DORONICUM*, *ECHINOPS*, *ECLIPTA*, *ELEPHANTOPUS*, *EMILIA*, *ENHYDRA*, *ERIGERON*, *ETHULIA*, *EUPATORIUM*, *GERBERA*, *GLOSSOCARDIA*, *GLOSSOGYNE*, *GNAPHALIUM*, *GRANGEA*, *GUIZOTIA*, *GYNURA*, *HELIANTHUS*, *HIERACIUM*, *HYPOCHOERIS*, *INULA*, *JURINEA*, *LACTUCA*, *LAGGERA*, *LAMPRACHAENIUM*, *LAUNAEA*, *MATRICARIA*, *MICROGLOSSA*, *MIKANIA*, *NOTONIA*, *OTHONNOPSIS*, *PEGOLETTIA*, *PICRIS*, *PLUCHEA*, *PULICARIA*, *SAUSSUREA*, *SENECIO*, *SIEGESBECKIA*, *SILYBUM*, *SOLIDAGO*, *SONCHUS*, *SPARGANOPHORUS*, *SPAERANTHUS*, *SPILANTHES*, *SYNEDRELLA*, *TAGETES*, *TANACETUM*, *TARAXACUM*, *TRAGOPOGON*, *TRICHOLEPIS*, *TUSSILAGO*, *VERNOMIA*, *VOLUTARELLA*, *WEDELIA*, *XANTHIUM*.

- A. Heads with the flowers all similar and tubular. Anthers cleft at the base. Leaves usually alternate. Flowers never yellow
 - I. Pappus absent.
 - a. Flower-heads 1 or more, glomerate and sessile in leaf axils *SPARGANOPHORUS*.
 - b. Flower-heads very numerous; peduncles short or long *ETHULIA*.
 - II. Pappus short, fugacious.
 - a. Achenes 8-10 ribbed *CENTRATHERUM*.
 - b. Achenes terete, shining *LAMPRACHAENIUM*.
 - III. Pappus chaffy. Heads few-flowered, crowded in dense bracteate clusters *ELEPHANTOPUS*.
 - IV. Pappus long, copious. Heads distinct, many-flowered *VERNOMIA*.
- B. Heads with the flowers all similar and tubular. Anthers subentire at the base. Leaves opposite or alternate. Corolla rarely orange, never yellow
 - I. Anther-tip truncate; pappus usually of 3 clavate hairs *ADENOSTEMMA*.

- II. Anther-tip appendiculate.
- a. Pappus usually of 5 paleaceous scales ... *AGERATUM*.
 - b. Pappus of slender hairs; involucral bracts ∞ ... *EUPATORIUM*.
 - c. Pappus of slender hairs; involucral bracts 4 ... *MIKANIA*.
- C. Heads with the flowers all similar or the outer ligulate. Anthers subentire (cells not tailed) at the base. Leaves usually alternate. Receptacle almost always naked. Disk-flowers yellow; ray-flowers yellow, white or purple.
- I. Flowers all yellow, those of the ray ligulate
Ligules few; heads in scorpioid panicles ... *SOLIDAGO*.
 - II. Flowers all yellow, ray absent. Pappus hardly any
 - a. Receptacle conic or convex. Achenes with a terminal toothed or bristly ring *GRANGEA*.
 - b. Receptacle usually elongate, top flat. Achenes obtuse, flat, with a thickened border ... *DICHOCEPHALA*.
 - III. Ray-flowers female, ligulate, never yellow. Disk-flowers yellow
 - a. Pappus of short bristles and 2-4 long hairs ... *BOLTONIA*.
 - b. Pappus hairs long, copious.
 - 1. Ligules long, uniserrate *ASTER*.
 - 2. Ligules 2-3-seriate *ERIGERON*.
 - IV. Ray-flowers very slender, tubular. Pappus-hairs copious, slender, 1-2-seriate, rather unequal ... *MICROGLOSSA*.
- D. Heads with the flowers all similar or the outer ligulate. Leaves usually alternate. Disk- and ray-flowers usually both yellow
- I. Heads androgynous. Receptacle naked. Style-arms of hermaphrodite flowers filiform, not truncate, or style of sterile flowers entire
 - a. Heads corymbose or panicled.
 - i. Herbs, often aromatic, with narrow bracts; pappus 1-seriate, caducous
 - i. Anther-bases tailed *BLUMEA*.
 - ii. Anther-bases not tailed *LAGGERA*.
 - 2. Shrubs or undershrubs with broad bracts; pappus 1-seriate, free or sometimes connate ... *PLUCHEA*.
 - b. Heads in dense, globose or ovoid clusters. Herbs with decurrent leaves; bracts paleaceous, few or many. Pappus absent *SPHAERANTHUS*.
 - II. Heads androgynous or homogamous. Involucral bracts scarious, usually hyaline. Style-arms of hermaphrodite flowers truncate
 - a. Hermaphrodite flowers all sterile with undivided or merely notched styles
 - Heads corymbose. Pappus hairs quite free ... *ANAPHALIS*.
 - b. Hermaphrodite flowers all or mostly fertile with divided styles
 - Female flowers 2- ∞ -seriate. Pappus-hairs never barbellate *GNAPHALIUM*.
 - III. Heads heterogamous, radiate, rarely subdisciform or homogamous. Receptacle naked. Hermaphrodite flowers with linear style-arms, rounded or dilated at the top
 - a. Heads rayed. Pappus-hairs few or many, sub-equal *INULA*.
 - b. Heads rayed or discoid, heterogamous. Achenes ribbed. Outer pappus of scales, inner of hairs ... *PULICARIA*.
 - c. Heads discoid, homogamous. Outer pappus of paleae, inner of hairs *PEGOLETTIA*.
 - d. Heads discoid, heterogamous. Pappus absent ... *CARPESIUM*.

- E. Heads usually radiate. Receptacle paleaceous. Anther-cells not produced into tails. Achenes 3-4-angled or terete or compressed
- Heads heterogamous or unisexual. Hermaphrodite flowers sterile, with undivided styles; female flowers apetalous
Involucral bracts of male flowers free, of female forming a 2-flowered, 2-celled capsule armed with glochidiate spines XANTHIUM.
 - Heads hetero- or homogamous. Leaves usually opposite.
 - Hermaphrodite flowers sterile. Achenes spinous with 2 long horn-like spines at top ... ACHANTHOSPERMUM.
 - Hermaphrodite flowers fertile.
 - Inner involucral bracts embracing the achenes.
 - Outer involucral bracts 5-glandular ... SIEGESBECKIA.
 - Outer involucral bracts 4, broad, in opposite pairs ... ENHYDRA.
 - Inner involucral bracts not embracing the achenes. Outer involucral bracts many ... ECLIPTA.
 - Inner involucral bracts not embracing the achenes. Paleae of receptacle concave, embracing the achenes.
 - Ray-flowers with large yellow ligules. Achenes thick ... WEDELIA.
 - Ray-flowers with white or yellow ligules. Achenes ciliate ... SPILANTHES.
 - Heads very large. Pappus of 1-3 deciduous bristles or scales or both. Ligule yellow ... HELIANTHUS.
 - Heads hetero- or homogamous. Hermaphrodite flowers all fertile or neuter. Achenes dorsally compressed
 - Outer involucral bracts herbaceous, subequal. Inner shorter like the paleae of the receptacle
 - Achenes small, 4-angled, sheathed at the tip by the hairy corolla; pappus absent ... GUAZOTIA.
 - Achenes flat, margins lacerate and winged; pappus of 2 slender awns ... SYNEDRELA.
 - Outer involucral bracts few, small; inner membranous, connate below
 - Style-arms with short appendages. Leaves alternate ... GLOSSOCARDIA
 - Style-arms with short appendages. Leaves opposite. Achenes usually 2-4-awned ... BIDENS.
 - Style-arms with long appendages. Achenes with 2 bristles ... GLOSSOGYNE.
 - Heads usually radiate and heterogamous. Bracts of involucra herbaceous. Receptacles without paleae. Pappus absent or of scales or bristles
Leaves opposite with oil-glands. Heads simple ... TAGETES.
 - Heads heterogamous, rayed or disciform or rayless and homogamous. Involucral bracts 2-∞-seriate. Receptacle naked or paleaceous. Style-arms truncate. Leaves usually alternate. Disk-flowers yellow, ray-flowers variously coloured
 - Receptacle paleaceous. Heads usually rayed
 - Achenes margined. Heads corymbose ... ACHILLEA.
 - Achenes 4-5-angled or many-ribbed. Heads peduncled ... ANTHEMIS.

- II. Receptacle naked or with fimbriate pits
- Heads rayed, usually long-peduncled. Achenes 5-10-ribbed CHRYSANthemum.
 - Heads rayed. Achenes ventrally 3-5-ribbed, dorsally ∞ -ribbed or plane MATRICARIA.
 - Heads disciform, peduncled. Involucral bracts 1-2-seriate COTULa.
 - Heads disciform, subsessile. Involucral bracts spreading in fruit CENTIPEDA.
 - Heads disciform, corymbose. Involucral bracts ∞ seriate TANACETUM.
 - Heads small, disciform, racemose or panicled .. ARTEMISIA.
- H. Heads heterogamous, rayed or disciform. Involucral bracts usually 1-seriate and subequal. Style-arms of hermaphrodite flowers truncate or appendaged. Pappus of fine hairs. Leaves usually alternate. Disk-flowers yellow, rays usually also yellow
- Involucral bracts 1-2-seriate, subequal, free nearly to the base. Style-arms of hermaphrodite flowers flattened or nearly clavate, papillose
Involucral bracts uniseriate. Heads rayed, bracteolate, solitary TUSSILAGO.
 - Involucral bracts 1-2-seriate, free nearly to the base, usually with a few smaller outer ones
 - Involucral bracts herbaceous, broad, acuminate. Heads large, rayed, long-peduncled
Receptacle hemispheric. Herbs, leaves alternate. DORONICUM.
 - Involucral bracts narrow with a few much shorter outer ones, except *Emilia* and some *Senecio*
 - Heads homogamous. Style-tips long, hairy ... GYNURA.
 - Heads homogamous, ebracteolate EMILIA.
 - Heads homogamous, style-tips ovate. Fleshy shrubs NOTONIA.
 - Heads rayed or disciform, homogamous. Style-tips truncate or short or absent. Leaves radical or alternate SENEPIO.
 - Heads heterogamous. Hermaphrodite flowers sterile. Glabrous undershrubs OTHONNOPSIS
 - Heads rayed. Involucral bracts 1-2-seriate, narrow, subequal. Style-arms of hermaphrodite flowers truncate or in sterile flowers undivided. Achenes without pappus
Achenes incurved. Herbs, with alternate leaves ... CALENDULA.
 - Flowers all tubular. Involucral bracts many-seriate, imbricate. Tips scarious, spinous or foliaceous. Achenes often hard. Pappus various, rarely absent. Leaves alternate, often spinous
 - Heads 1-flowered, crowded into involucrate globose balls ECHINOPS.
 - Heads ∞ -flowered, separate. Achenes glabrous. Pappus-hairs distinct or connate
 - Filaments free glabrous. Pappus hairs free, caducous. Involucral bracts with hooked bristles. Leaves unarmed ARCTIUM.
 - Filaments papillose-hairy. Pappus-hairs connate into a deciduous ring
 - Pappus-hairs simple, not feathery CARDUUS.
 - Pappus-hairs feathery CNICUS.
 - Filaments glabrous, connate
Involucral bracts spinous. Receptacle bristly. Pappus simple SIBYLM.
 - Filaments free, glabrous
 - Pappus-hairs uniseriate, feathery, with a few outer simple SAUSSUREA.
 - Pappus-hairs ∞ -seriate, rigid, rough or feathery. JURINEA.

- III. Heads separate, ∞ -flowered. Achenes glabrous.
 Basal areole oblique or lateral
 a. Involucle not bracteate at the base or rarely so
 1. Filaments papillose. Anther-tails lacerate.
 Achenes smooth TRICHOLEPIS.
 2. Achenes terete, 10-15-ribbed ... VOLVATARELLA.
 3. Achenes compressed or 4-angled, 4-5-ribbed ... CENTAUREA.
 b. Involucle bracteate at the base by spinous leaves
 Achenes compressed or angled. Pappus paleaceous
 or absent CARTHAMUS.
- K. Heads hetero- or homogamous, rayed or not. Involucral
 bracts ∞ -seriate, unarmed. Corolla 2-lipped, ligulate,
 or deeply 5-fid. Style-arms rounded or truncate, not
 appendaged. Leaves rarely opposite.
 a. Corolla tubular. Pappus hairs feathery. Rigid
 shrubs DICOMA.
 b. Corolla 2-lipped or ligulate. Scapigerous herbs GERBERA.
- L. Heads homogamous. Corollas all ligulate. Ligule
 truncate, tip 5-toothed. Style-arms slender, Herbs;
 juice usually milky. Leaves radical or alternate, never
 opposite
 I. Achenes truncate. Pappus of scales with sometimes
 alternating hairs or absent
 Rigid herbs. Flowers bluc. Inner involucral
 bracts coriaceous, concave ... CICHORIUM.
 II. Achenes usually contracted at both ends. Involucle
 calyculate, inner bracts often thickened. Usually
 leafy herbs, not woolly nor with stellate hairs.
 a. Achenes ribbed, rugose; pappus hairs feathery ... PICRIS.
 b. Achenes ribbed; pappus hairs simple, free, white. CREPIS.
 III. Herbs, usually perennial, more or less stellately hairy.
 Achenes truncate. Pappus hairs simple.
 Pappus hairs rigid, bristles usually rough, brown. HIERACIUM.
 IV. Scapigerous herbs. Hairs various. Achenes con-
 tracted below. Pappus-hairs simple or feathery
 a. Receptacle naked. Pappus-hairs simple ... TARAXACUM.
 b. Receptacle paleaceous. Pappus hairs feathery ... HYPOCHOERIS.
 V. Herbs, rarely shrubby below, glabrous or hispid,
 rarely scapigerous. Achenes usually narrowed be-
 low. Pappus-hairs many, simple
 a. Achenes compressed, beaked, ribs smooth ... LACTUCA.
 b. Achenes compressed, not beaked, many-ribbed.
 Ribs smooth or rough SONCHUS.
 c. Achenes narrow, truncate at both ends, 4-5-ribbed. LAUNAEA.
 VI. Herbs, glabrous, woolly or hispid. Achenes with
 a broad base, or curved hollow stipes, above
 narrowed or beaked TRAGOPOGON.
 Involucral bracts 1-seriate. Achenes long-beaked.

ACANTHOSPERMUM.

This genus numbers three species known from tropical America and Hawaii.

In Gold Coast *A. hispidum* DC. is used in the treatment of leprosy.

One of the species, **A. Brasiliium** Schrank, is now established in and about the town of Singapore. An infusion of the leaves—4 parts in 200 parts of boiling water—is used in Brazil as a diuretic and sudorific. The aromatic bitter leaves are also recommended in the treatment of blennorrhagia.

Brazil: Picao da praia—; *Uruguay*: Yerba de la oveja—.

ACHILLEA.

The genus includes 115 species, natives of temperate regions of the northern hemisphere.

The following species are used medicinally in Europe—*A. Ageratum* Linn., *A. atrata* Linn., *A. Millefolium* Linn., *A. moschata* Jacq., *A. nana* Linn., *A. nobilis* Linn., *A. Ptarmica* Linn.—; in China and Indo-China—*A. sibirica* Ledeb.—; in North America—*A. Millefolium* Linn.—; in India—*A. Millefolium* Linn., *A. Santolina* Linn.—.

- | | | |
|-------------------------------|-----|----------------------------|
| 1. Rays white, pink or purple | ... | ... <i>A. Millefolium.</i> |
| 2. Rays yellow | ... | ... <i>A. Santolina.</i> |

1. Achillea Millefolium Linn. is found in the western Himalaya, from Kashmir to Kumaon, at altitudes of 6,000 to 9,000 feet. It extends to Northern Asia, Europe, and North America. A very common plant on roadsides and pastures and banks.

Many healing virtues have been and are still ascribed to this herb which, whatever its virtues may be, is still regularly cultivated for medicinal purposes. The annual consumption in the British Isles alone is from 10 to 20 tons. The herb is officinal in Austria; and the leaves are officially recognized in Portugal, Russia, Sweden, and Switzerland.

The herb is diaphoretic, stimulant, tonic. It is most useful in colds, obstructed perspiration, and the commencement of fevers. It opens the pores freely and purifies the blood. It has also proved useful in hysteria, flatulence, heartburn, colic, and epilepsy.

It is much used in England as a vulnerary, and is given internally for the suppression of haemorrhages and of profuse mucous discharges. It is employed also in intermittents and as an antispasmodic in flatulent colic and nervous affections. Its hot infusion is used as an emmenagogue in France, and also in the suppression of the lochia; it is sometimes employed in low exanthematous fevers with difficult eruption. In the United States the infusion is occasionally used in acute suppression of the menses.

An ointment made by the Highlanders of Scotland of the fresh plant is good for piles, and is also considered good against the scab in sheep. Milfoil tea is held in much repute in the Orkneys for dispelling melancholy. A decoction of the whole herb is employed for bleeding piles, and is good for kidney disorders. It has the reputation also of being a preventive of baldness, if the head be washed with it.

A medicinal tincture is prepared from the whole plant with spirit of wine. This, when employed in a diluted form of the first or third decimal strength, and in small doses from five to ten drops in a tablespoonful of cold water, will act admirably in arresting bleeding from the lungs, the kidneys, or the nose, especially in florid hectic subjects. It has been found by healthy provers that stronger or larger doses of any preparation of the herb will induce or aggravate one or another of these bleedings.

To stimulate and promote the appetite the fresh juice of the plant may be had, a dessertspoonful three times in the day.

Italian peasants apply the fresh juice topically as an astringent to piles, varicose ulcers, and sore nipples. Among the Spanish-Californians the fresh plants are used for stanching the blood in recent wounds.

Linnaeus recommended the bruised herb, fresh, as an excellent vulnerary and styptic. It is employed in Norway for the cure of rheumatism, and the fresh leaves chewed are said to cure toothache.

In France the powdered dried leaves are used as a sternutatory. Or the leaf, being rolled up, is applied to the nostrils to cause bleeding and thus afford relief to headache.

In Scotland a warm decoction of the fresh leaves is regarded as a family specific against the colds and other ailments common to childhood.

Externally, a strong decoction of the leaves has been used as an injection into the nostrils to stay bleeding from the nose. It is similarly of service for piles, and for female floodings, because exerting a special local action on the organs within the middle trunk. It is further of benefit for sore nipples as a lotion, and for a relaxed sore throat as a gargle; also as a hair-wash.

An infusion was used by the Winnebag Indians of North America to bathe swellings. For earache a wad of the leaves, also the infusion was put into the ear.

In California the leaves steeped in hot water are considered very healing applications to cuts or bruises, and are used for poulticing skin rash.

The flowering plant or flowers are stimulant, aromatic, sudorific, tonic, astringent, diuretic, and vulnerary. An essential oil, extracted from the flowers, is taken in a dose of from three to five drops to stimulate and promote the appetite.

Mahomedan writers acknowledge the virtues of the plant collected in the wild state, when in flower.

In Sweden and in some parts of Africa the plant has been used in the manufacture of beer. Linnaeus considered beer thus brewed more intoxicating than when hops were used.

Achilleine, an amorphous bitter alkaloid of unknown composition, has been isolated.

Afghanistan: Buimaderan—; *Arabia*: Suila—; *Bombay*: Rojmati—; *California*: Milfoil, Old Man, Yarrow—; *Catalan*: Herba de tall, Marfull, Milfullcs, Percala—; *Colombia*: Colchón de pobre—; *Cutch*: Biranjasif—; *Danish*: Roellike—; *Dutch*: Duizenblaad, Duizendblad—; *English*: Bad Man's Plaything, Bloodwort, Carpenter's Weed, Devil's Nettle, Devil's Plaything, Knight's Milfoil, Milfoil, Nosebleed, Old Man's Mustard, Old Man's Pepper, Sanguinary, Soldier's Woundwort, Staunch Grass, Staunchweed, Thousand Leaf, Thousand Weed, Yarrow, Yarroway—; *French*: Achilléine, Endove, Herbe à la coupure, Herbe au charpentier, Herbe aux charpentiers, Herbe aux cochers, Herbe aux coupures, Herbe aux militaires, Herbe aux voituriers, Herbe à saigner, Herbe de Saint Jean, Herbe militaire, Millefeuille, Saigne nez, Seignenez, Sourcils de Vénus—; *German*: Achilleskraut, Angerblume, Anserine, Bauchwehkraut, Edelgarbe, Fasankraut, Feldgarbe, Gachel, Gacht, Gaensezungen, Gaerb, Garwekraut, Gerbel, Gollenkraut, Gor, Gotteshand, Grillen, Grinsing, Gruensing, Gruettblume, Gruetenkraut, Grundheil, Hasegerf, Hasengarben, Heftkraut, Heidekraut, Jase, Judenkraut, Jungfrauakraut, Kachelblume, Karweblume, Katzenfittich, Katzenschwanz, Kelkenkraut, Kerpen, Kraenzel, Krebselkraut, Loewensüsskraut, Margaretenkraut, Marienkranz, Reels, Reels,

Relaka, Releke, Relik, Relkike, Roelike, Roelcken, Roellicke, Roelskraut, Rohlech, Ruels, Saegkraut, Schabab, Schabor, Schafgarbe, Schaffripchen, Schafrippe, Schafzunge, Schapschar, Schober, Sichelblume, Sichelschnitt, Siebengartenkraut, Tausendblatt, Weisses Garbenkraut, Zeiskraut, Zimmermannskraut—; *Greek*: Myriophyllum—; *Hindi*: Gandana—; *Hungarian*: Ezer-levelu-fa—; *Irish*: Athairthalmhna—; *Italian*: Millefoglie, Millefoglio—; *Kashmir*: Momadruhopandiga—; *Malta*: Common Milfoil, Yarrow, Haxixa tal morliti—, *Pacific Coast*: Dog-daisy, Green Arrow, Milfoil, Nose-bleed, Oldman's Pepper, Soldier's Woundwort, Yarrow—; *Persian*: Buimaderan—; *Polish*: Tysiacznik ziele—; *Portuguese*: Mil em rama, Miifolha, Milfolhada—; *Roumanian*: Coada soarecelului—; *Russian*: Tesyachelistnik—; *Saxon*: Gearwe—; *Spanish*: Filigrana, Manzanilla de los montes, Milefolio, Milenrama, Milhojas, Yerba de Aguires, Yerba de San Juan—; *Swedish*: Roelleke, Rofleka—; *Urdu*: Biranjasifa—.

2. **Achillea Santolina** Linn. is found in Baluchistan, whence it extends to Afghanistan, Iran and the Mediterranean. It is widely distributed in the East and in Northern Africa.

The plant is in common use as a tonic and carminative in Iran and Sind. At Chaman, in Baluchistan, it is given to children to cure stomachache. The strong odour of the herb drives away fleas and other noxious insects.

Arabic: Rebey-cl-ghebel—; *Egypt*: Ba'eytheran, Bishrin, Ghobeyra, Gesum—; *Iraq*: Gaisumi, Qaisum—; *Kalat*: Bo-i-madaran—; *Mach*: Boemadran—; *Persian*: Biianjasib, Biranjasif, Bu-i-maderan—; *Pushtu*: Zawal—; *Teheran*: Bumadran—.

ADENOSTEMMA.

The genus consists of 5 or 6 American species, one of them cosmopolitan.

Adenostemma viscosum Forst. is found in all tropical countries. It occurs throughout India, Ceylon, and the Malay Peninsula. It is common in waste ground and in damp spots in forests, ascending to 4,000 feet in Malaya, to 5,000 feet on the Himalaya and other ranges, and to 6,000 feet in Ceylon.

The plant is used medicinally in La Reunion, the leaves are antispasmodic, and the fresh juice is a good stimulant and sternutatory.

Malay: Rumput babi, Rumput pasir, Sumbong gajah—.

AGERATUM.

The genus numbers 45 American species, one of them cosmopolitan.

Ageratum conyzoides Linn. is one of the commonest weeds of the Tropics. It is found throughout India, common everywhere in waste ground and on the outskirts of villages; it ascends the Himalayas to 5,000 feet.

The plant is applied externally in ague. Its juice is said to be a good remedy for prolapse of the anus. It is used in Togoland to cure fever. In Yoruba a decoction is given for 'craw-craw' externally and for fever internally. An infusion is prescribed in

Brazil and Guiana as a stimulant tonic in diarrhoea and flatulent colic.

The juice of the root is said to possess antidiysenteric properties and, together with the leaves, is a common Indo-Chinese remedy for diarrhoea and dysentery. The juice of the root is moreover credited with the virtue of preventing the formation of stone or calculus in the bladder.

In Ceylon the leaves are commonly applied to wounds and sores; they act as a styptic and heal them quickly. In Gold Coast Colony the leaves are squeezed, and the juice is used as a lotion for the eyes. In Sierra Leone the chief use of the leaves is a remedy for craw-craw; they are also applied to chronic ulcers, and intravaginally for uterine troubles; crushed in water they are given as an emetic. In Southern Nigeria a decoction is both used as a lotion for craw-craw and taken internally for fever. In Siberia pneumonia in children is treated by rubbing an extract of the leaves on the chest. In South Cameroons the leaves pounded with *Ocimum* and macerated in water along with 'bush pepper' are prepared as a purgative enema. Some tribes in Portuguese Congo use it in the treatment of sleeping sickness.

The plant is a household medicine in Madagascar, Mauritius and La Reunion. As a fomentation the leaves and stems are used in skin diseases, more particularly leprosy; and they are prescribed as a bath to patients with ecchymoses. A poultice of the leaves is applied on boils; it is said to prevent tetanus if applied to a wound. A cold decoction of the roots is used as a lotion in purulent ophthalmia.

Ashanti: Gu-ekura, Guakuro—; *Australia*: Billy-goat weed—; *Bengal*: Dochunty, Uchunti—; *Benin*: Ebighoedore, Ehigodore—; *Betsimisaraka*: Fotsivony, Tinimbo—; *Bombay*: Osari, Sahadevi—; *Brazil*: Camara apeba, Fumo bravo, Mentrøsto, Suacuaira—; *Ceylon*: Pumpilli—; *Efik*: Ikongifoyen, Otitidahadaha—; *English*: Goatweed, White Weed—; *Ewe*: Mimang—; *Fanti*: Efungmormoe—; *French*: Herbe à Madame—; *French Guiana*: Raguet francois—; *Gold Coast*: Goat Weed—; *Gujerati*: Ajgandha, Gandharisedardi, Mankdamari—; *Ibo*: Ikbu odols—; *Ibuzo*: Ikbu odolo—; *Indo-China*: Bong thui, Bu xich, Cut ion, Thang hong ke—; *Karwar*: Ghayamari—; *Kathiawar*: Makadamari—; *Konkani*: Sahadevi—; *Lagos*: Imi-esu—; *La Reunion*: Herbe à bouc—; *Lepcha*: Nam-yu muk—; *Madagascar*: Hanitrinimpantsaka—; *Mano*: Dah vo—; *Malay*: Sianggit, Tahi ayam, Tombok jantan—; *Malayalam*: Appa, Muryanpacha—; *Marathi*: Ghanera osadi—; *Mauritius*: Herbe du bouc—; *Menéde*: Ngugbe, Ngulugbei, Yanigbei—; *Mundari*: Purudumlu—; *Nepal*: Ilami—; *New Caledonia*: Adivjalakarta—; *Oloke-Meji*: Imi-esu—; *Overri*: Ahihia-nwa-oshi-naka, Akwukwo-moosinaka, Osu angweri ngwa—; *Sierra Leone*: Akan yunyun, Craw-craw plant—; *Sinhalese*: Hulantal—; *Timi*: Balkeyan, Ka-balkeyan, Keyan—; *Twi*: Guakuro, Gu airkuna, Gu-ekura—; *Umu Ahia*: Osu angrocri ngwa—; *Uriya*: Boksunga, Poksunga—; *Wassaw*: Ahaban kankan—; *Yoruba*: Akkaw-yungun, Imi-oshu—.

ANAPHALIS.

The genus consists of 50 species, chiefly temperate and mountain plants of Asia, Europe, and America.

A. margaritacea Benth. and Hook. is used medicinally in North America.

In the Nilghiris several species are used for cut wounds. The more commonly employed is *A. neelgerryana* DC., which occurs at an altitude of 7,000-8,250 feet. The fresh leaves are bruised and applied to the wound as a plaster.

Nilghiris: Katplaster—; *Sanskrit*: Raktaskandana, Vranapata—.

ANTHEMIS.

The genus includes 120 species, natives of Europe as far as Siberia—only one being native of Abyssinia—, and often naturalised elsewhere.

A. arvensis Linn., *A. Cotula* Linn., and *A. nobilis* Linn. are used medicinally in Europe and in North America; *A. Gayana* Boiss. and *A. odontostephana* Boiss. in Baluchistan; *A. Wiedemanniana* Fisch. and Mey. in Persia.

1. Achenes turbinate, tubercled, tip crenulate ... *A. Cotula*.
2. Achenes smooth, sulcate, slightly narrowed at the base, angular, truncate at the apex; margin acute, narrow *A. Gayana*.
3. Achenes cylindric, ribbed, tubercled; tip of outer toothed, of inner with a short auricle *A. odontostephana*.

1. **Anthemis Cotula** Linn. occurs in Baluchistan and Northern Asia. It is distributed westwards to Britain and the Canary Islands; and is found in Europe, North Africa, Siberia and West Asia. It has been introduced into North America.

The flowers and the leaves are tonic, antispasmodic, emmenagogue, and emetic. They have been used with success in sick headache, in convalescence from fevers, and in the absence or abnormal stoppage of the menses. The warm infusion of 1 ounce in 1 pint of boiling water is taken in wineglassful doses when required.

A strong decoction causes sweating and vomiting. It is said to be nearly as valuable as opium in dysentery. It has also been used in scrofula, dysmenorrhœa and flatulent gastritis. It is administered to induce sleep in asthma.

Applied to the skin fresh and bruised it is a safe vesicant. A poultice helpful in piles can be made from the herb boiled until soft, or it can be used as a bath or fomentation.

In hysteria the herb is used in Europe as an antispasmodic and emmenagogue. It is prescribed in North America for pulmonary and rheumatic affections.

The whole plant has a very foetid odour, which rubbing increases. It is full of an acrid juice which is liable to blister. Bees dislike it, and it is said to drive away flies and fleas.

Catalan: Camamilla pudenta—; *England*: Balder Brae, Baldeyebrow, Camomile, Camovyne, Cotula, Dog's Camomile, Dog-binder, Dog Daisy, Dog-fennel, Dog-finkle, Flowan, Hog's Fennel, Horse Daisy, Jayweed, Madder, Madenwede, Marse, Marg, Mathes, Mayweed, Morgan, Murg, Poison Daisy, Stinking Camomile, Wild Camomile—; *French*: Amarelle, Amouroke, Bouillot, Camomille fétide, Camomille puante, Chaillerie, Chamaran, Chamarou, Herboula, Maroule, Maroune, Maroute, Maroute puante, Oeil-de-vache, Queuneron—; *German*: Hundskamille, Hundskamillenkraut, Stinkende Kamille—; *Italian*: Camomilla puzzolente—; *Pacific Coast*: Bald-eyebrow, Chigger-weed, Dill-weed,

Camomile, Dog Daisy, Dog-fennel, Fetid Mayweed, Fieldwort, Hog-fennel, Horse Daisy, Madder, Mayweed, Poison Daisy, Stinking Camomile—; *Roumanian*: Mararui-cainalui, Mormorita, Romanita-puturoasa—; *Spanish*: Cotula fetida, Manzanilla hedionda—; *Uruguay*: Manzanilla—.

2. **Anthemis Gayana** Boiss. inhabits Baluchistan whence it extends to Persia.

In the Harboi Hills the leaves are eaten to cure pains in the chest.

Harboi Hills: Piunphuli—.

3. **Anthemis odontostephana** Boiss. is found at Peshawar, whence it spreads to Afghanistan, Baluchistan, and Persia.

A decoction of the flowers is used in Baluchistan as a febrifuge and carminative.

ARCTIUM.

The genus consists of 3 or 4 species spread over temperate Asia and Europe.

Arctium Lappa Linn. is found in Western Himalaya from Kashmir to Simla at altitudes of 6,000-8,000 ft., and also in Western Tibet where it ascends to 11,000-13,000 feet. It extends westwards towards the Atlantic and occurs in Syria, Persia, and Khorasan, as well as in Europe. It is common in North and Central China, and Manchuria, and is abundant in the United States.

The root is regarded throughout India as depurative and anti-phlogistic. In Teheran the root, with that of sarsaparilla, is used as a remedy for syphilis. In the Pacific Coast States of America the dried first year root is considered alterative, aperient, diuretic, and diaphoretic.

The root, stem, and seeds are used medicinally in China. The seeds are alterative, depurative, diaphoretic, and diuretic.

The plant grows freely throughout Europe and the United States on waste ground and about old buildings, by roadsides and in fairly damp places. It had a great reputation in the past, and its fruits and roots still figure largely among the drugs commonly used by herbalists in Europe and America. It is alterative, diuretic, and diaphoretic; one of the finest blood purifiers in the herbal system. In all skin diseases it is a certain remedy and has effected a cure in many cases of eczema. The root is principally employed, but the leaves and fruits—erroneously called seeds—are equally valuable. Both root and seed may be taken as decoction of 1 ounce to a pint and a half of water, boiled down to 1 pint, in doses of a wine-glassful three or four times a day. The antiscorbutic properties of the mucilaginous, demulcent root make the decoction very useful for boils, scurvy, and rheumatic affections; it has in addition been recommended for external use as a wash for ulcers and scaly skin disorders. It is officinal in Portugal and Spain.

An infusion of the leaves is useful to impart strength and tone to the stomach, for some forms of long-standing indigestion. When applied externally as a poultice, the leaves are highly resolvent for

tumours and gouty swellings, and relieve bruises and inflamed surfaces generally. The bruised leaves have been applied by the peasantry in many countries as cataplasms to the feet and as a remedy for hysterical disorders.

From the seeds (or fruits), both a medicinal tincture and a fluid extract are prepared, of benefit in chronic skin diseases when taken, in doses of from ten to thirty drops with two tablespoonfuls of cold water three times a day, steadily for several weeks or months. Americans consider the seeds more efficacious and prompt in their action than the other parts of the plant. They are relaxant and demulcent, with a limited amount of tonic property. Their influence upon the skin is due largely to their being of such an oily nature; they affect both the sebaceous and sudoriferous glands and restore to the skin that smoothness which is a sign of normal healthy action.

The infusion or decoction of the seeds is employed in dropsical complaints, more especially in cases where there is co-existing derangement of the nervous system, and is considered by many to be a specific for all affections of the kidneys, for which it may with advantage be taken several times a day, before meals.

The root contains inulin, mucilage, sugar, a bitter crystalline glucoside called lappin, a little resin, and tannic acid. The ashes of the plant, burnt when green, yield carbonate of potash abundantly, and also some nitre.

Anglo-Saxon: Fox's clote—; *Catalan*: Bardana, Llapassa, Repalassa—; *China*: E Shih, Niu P'ang, Niu Tzu, Ta Li, Wu Shih—; *Dutch*: Dokke-bladen, Klis, Klisse, Klit—; *English*: Aireve, Airup, Beggar's Buttons, Burdock, Clithe, Clot-bur, Cockle-buttons, Cuckoo Button, Great Burdock, Happy Major, Hardock, Harebur, Herrif, Hurbur, Lappa, Love Leaves, Personata, Philanthropium, Turkey-bur, Thorny Bur—; *French*: Bardane, Bardane à grosses têtes, Bouillon noir, Coupeau, Dogue, Glouteron, Glotteron, Grande bardane, Grattrau, Grippe, Guippon, Herbe aux bardanes, Herbe aux teigneux, Lappe, Oreille de géant, Peigneronne, Picons, Poire de vallée—; *German*: Gemeine Klette, Grosse Klette, Klette—; *Greek*: Arkeion, Arktion, Prosopion, Prosopis—; *Italian*: Arsio, Bardana, Lappa maggiore, Lappola maggiore—; *Malaya*: Ngow chee—; *Pacific Coast*: Bazzies, Beggar's Buttons, Burdock, Cuckoo-button, Great Burdock, Harcbur, Turkey-bur—; *Polish*: Lopian—; *Portuguese*: Bardana—; *Roumanian*: Brustur, Lipan—; *Russian*: Lapushnik, Rapeynik—; *Spanish*: Amores ruines, Baudana, Lampazo, Lapa—; *Teheran*: Bardane—.

ARTEMISIA.

This genus includes about 280 species, natives mostly of the northern hemisphere, a few from South Africa and South America.

The following species are used medicinally in Europe.—
A. Absinthium Linn., *A. abrolanum* Linn., *A. arborescens* Linn., *A. caerulescens* Linn., *A. campestris* Linn., *A. Dracunculus* Linn., *A. gallica* Willd., *A. glacialis* Linn., *A. Herba-alba* Asso, *A. hispanica* Lam., *A. maritima* Linn., *A. Mutellina* Willd., *A. pontica* Linn., *A. scoparia* Waldst. and Kit., *A. spicata* Wulf., *A. vallesiana* Lam., *A. vulgaris* Linn.—; in Palestine and Syria—*A. Herba-alba* Asso, *A. judaica* Linn.—; in Arabia and Egypt—*A. judaica* Linn.—; in Persian and Turkistan—*A. Cina* Berg., *A. Vahliana*

Kostel—; in China *A. annua* Linn., *A. apiacea* Hance, *A. capillaris* Thunb., *A. japonica* Thunb., *A. Heiskeana* Miq., *A. stelleriana* Bess., *A. vulgaris* Linn.—; in Indo-China—*A. abrotanum* Linn., *A. annua* Linn., *A. apiacea* Hance, *A. capillaris* Thunb., *A. carvifolia* Roxb., *A. sina* Berg., *A. japonica* Thunb., *A. Heiskeana* Miq., *A. maritima* Linn., *A. vulgaris* Linn.—; in Malaya—*A. maritima* Linn., *A. vulgaris* Linn.—; in the Philippine Islands—*A. vulgaris* Linn.—; in North America—*A. Absinthium* Linn., *A. ludoviciana* Nutt., *A. Santonicum* Linn.—; in the Pacific Coast States—*A. Absinthium* Linn., *A. annua* Linn., *A. californica* Less., *A. dracunculoides* Pursh., *A. tridentata* Nutt., *A. vulgaris* Linn.—; in Mexico—*A. mexicana* Willd.—; in North Africa and the Canary Islands—*A. ramosa* C. Sm.—; in South Africa—*A. afra* Jacq.—.

- A. Heads heterogamous, outer flowers female, disk-flowers hermaphrodite, sterile. Receptacle naked
 - 1. Perennial 4. *A. Dracunculus*.
 - 2. Annual. Very strong scented 2. *A. annua*.
 - 3. Annual, or rootstock perennial. Faintly scented ... 8. *A. scoparia*.
- B. Heads homogamous. Flowers all fertile. Receptacle naked 5. *A. maritima*
- C. Heads heterogamous. Ray-flowers female, disk-flowers hermaphrodite, all fertile.
 - 1. Receptacle puberulous. Perennial with rather large head 6. *A. persica*.
 - 2. Receptacle naked.
 - a. Annual; quite glabrous 3. *A. carvifolia*.
 - b. Perennials with usually small heads.
 - i. Leaves large, ovate, lobed, laciniate or 1-2 pinnatifid 10. *A. vulgaris*.
 - ii. Leaves long-petioled, ovate- pinnatisect ... 7. *A. sacrorum*.
- D. Heads heterogamous. Ray-flowers female, disk-flowers hermaphrodite, both fertile. Receptacle covered with long hairs
 - 1. Perennial 1. *A. Absinthium*.
 - 2. Annual or biennial 9. *A. Siversiana*.

1. **Artemisia Absinthium** Linn. inhabits Kashmir where it is found at altitudes of 5,000—7,000 ft. It is distributed over Northern Asia, Afghanistan, and westwards to the Atlantic. It is now naturalized and rather common in eastern Canada to Pennsylvania, growing along roadsides and waste places.

The herb has a strong fragrant odour which exercises a powerful influence over the nervous system. Its tendency to produce headache and other nervous disorders is well known by travellers in Kashmir and Ladak, who suffer severely when marching through the extensive tracts of country covered with this plant.

The whole plant is an aromatic tonic, and formerly enjoyed a high reputation in debility of the digestive organs. Wormwood tea, or the powdered herb in small doses, mixed in a little soup, will serve to relieve bilious melancholia, and will help to disperse the yellow hue of jaundice from the skin.

The juice of the larger leaves which grow from the root before the stalk appears has been used as a remedy for jaundice and dropsy, but it is intensely nauseous. A light infusion of the tops

of the plant, used fresh, is excellent for all disorders of the stomach, creating an appetite, promoting digestion, and preventing sickness after meals, but it is said to produce the contrary effect if made too strong.

The flowers, dried and powdered, are said to be most effectual as a vermisfuge, and used to be considered excellent in agues. Before the discovery of cinchona they were largely used in intermittents.

The plant yields by distillation a dark green or yellow oil which is used as worm-expeller. However, Caius and Mhaskar have shown experimentally that neither the herb nor the oil are effective as anthelmintics against hookworms. In large doses the volatile oil is an active narcotic poison. The main constituents of the oil are absinthol and absinthin, the former largely responsible for the characteristic odour of the plant and the latter for its intense bitter taste.

The herb is prescribed in the form of a poultice or fomentation as an antiseptic and discutient.

Arabic : Afsantin—; *Bologna* : Zicus—; *Catalan* : Donsell, Donzell, Donzell muscle—; *Como* : Medegh—; *Danish* : Malurt—; *Deccan* : Vilayatiafsantin—; *Dutch* : Alsem, Groote Alsem—; *English* : Absinth, Green Ginger, Madderwort, Mingwort, Mugwort, Warmot, Wermuth, Wormwood—; *French* : Absin menu, Absinthe, Absinthe amère, Absinthe commune, Absinthe vulgaire, Alliene, Aloine, Alunine, Aluyne, Alvine, Alvinea, Aoussin, Armoise-absinthe, Armoise amère, Grande Absinthe, Herbe sainte, Herbe aux vers—; *Friuli* : Assinz, Sinz—; *Genoa* : Bonmegu, Erba medgu—; *German* : Aelsch, Allsam, Allsei, Alsam, Alschi, Alsen, Baermede, Bitteralsen, Bitterbeifuss, Bitterkraut, Elch, Else, Elzkraut, Ilsem, Kampferkraut, Kittelkraut, Knooopvanalsen, Magenkraut, Malnit, Meelrasch, Pardehan, Pardesan, Vraemte, Waermde, Waermkraut, Warmude, Wermde, Weissrauch, Wermuth, Wiegenkraut, Woerken, Woermde, Woermke, Wormeth, Wraemte, Wroembk, Wuermken, Wurmei, Wurmet, Wurmtd—; *Greek* : Apsidia, Apsinthia, Apsinthion, Apsinthos, Apsithea, Apsithia—; *Hindi* : Vilayatiafsantin—; *Italian* : Assenzio—; *Lombardy* : Incens, Incens de bigat—; *Malayalam* : Shulabandha—; *Malta* : Wormwood, Assenzio, Assenziu—; *Norwegian* : Malurt—; *Pacific Coast* : Absinthium, Madderwort, Mingwort, Oldwoman, Wormwood—; *Padua* : Bun maja—; *Pavia* : Assenzi—; *Persian* : Afsantin—; *Piedmont* : Bonme, Bonmi, Dusang, Erba meja, Erba mia, Fort, Incenso, Insens, Insens grousser, Medighdt, Ourtmia, Ourtmiglia—; *Potenza* : Naseienzo—; *Reggio* : Aluina, Alvina, Asseinzi—; *Romagna* : Absanta, Absent, Absent rumen, Absent dal foj lerghi—; *Roumanian* : Pelin—; *Russian* : Polin—; *Sanskrit* : Damar—; *Spanish* : Ajenjo, Doncel—; *Treviso* : Bon maistro—; *Tuscany* : Assenzo—; *Verona* : Medego maistro—.

2. **Artemisia annua** Linn. occurs in the Punjab, from Peshawar to Waziristan, ascending up to 5,500 ft. It spreads to Afghanistan, Indo-China, China, Siberia, and westwards to Hungary.

In China and Malaya the dried leaves and stalks are used in skin diseases. The herb is a popular medicine in Indo-China, where it is considered a good stomachic and diuretic, and is prescribed in jaundice and in skin diseases.

Chinese : Huang Hua Hao, Ch'ing Hao—; *Indo-China* : Che noi, Hoang hoa cao, Nhan tran—; *Malaya* : Ching hoh—.

3. **Artemisia caruifolia** Roxb. is found in eastern Bengal, Assam, Nepal, Burma, whence it extends over to China.

The toasted plant is much used medicinally in Annam. It is recommended for fevers, chronic diarrhoea, phthisis with emaciation, purulent scabies with ulcers, and intestinal troubles. Externally it is applied to wounds due to metallic instruments.

Annam : Cay thanh hao, Co thanh hao, Ran hao, Thanh cao, Thanh hao—.

4. **Artemisia Dracunculus** Linn. is found in Western Tibet and in the western Himalaya at altitudes of 14,000-16,000 ft. It is distributed to Afghanistan, Western Asia, South and Mid Russia.

The aromatic leaves are credited with aperient, stomachic, stimulant, and febrifuge properties.

Dutch : Dragon—; *English* : Little Dragon Mugwort, Tarragon—; *French* : Dragon, Dragonne, Estragon, Fargon, Herbe au dragon, Herbe dragonne—; *German* : Dragun, Kaisersalat—; *Italian* : Dragontea—; *Portuguese* : Estragao—; *Roumanian* : Tarhon—; *Russian* : Estragon—; *Spanish* : Dragoncillo, Estragon—.

5 **Artemisia maritima** Linn., in its many variations of forms, has an extremely wide distribution in the northern hemisphere of the Old World, occurring mostly in saltish soils. It is found in the salt plains of Western Tibet, where it grows in abundance and ascends up to 9,000-14,000 ft. It occurs at an altitude of 7,000-9,000 ft. in the Western Himalaya from Kashmir to Kumaon. It covers immense tracts in Northern Asia from Chinese Mongolia to Central Siberia, the region of the Caspian, and Southern Russia. It is found on saline soils in Hungary, on the coasts of the Baltic, of France and the Mediterranean, and in the salt marshes of the British Isles. In Britain it spreads as far as Wigton on the West and Aberdeen on the East; it also thrives in north-east Ireland and in the Channel Islands.

The medicinal properties of the plant are those of a slight tonic, inferior in efficacy to common wormwood; and it is not often employed except in discutient and antiseptic fomentations, for inflammations, tumours, and foul ulcers; where its topical application has been thought beneficial. It is still often made use of by country people for intermittent fever.

In Southern Afghanistan and Baluchistan the plant is much used as an antiperiodic. An infusion, and also decoction, of the fresh plant has been very successfully used in cases of ague, intermittent and remittent fever.

At Kirani, near Quetta, the plant is given to children for stomach-ache; at Sanjawi it is a cure for jaundice.

In Bombay, the Hakims prescribe it in doses of 2 to 3 drachms as an anthelmintic, and also deobstruent and stomachic tonic. In the form of a poultice, they use it to relieve the pain caused by the bites of scorpions and venomous reptiles. But Mhaskar and Caius have successfully demonstrated that, whether it be snake bite or scorpion sting, the treatment is useless.

The flower-heads are collected from the villages around Teheran and sold as a vermifuge. There is little doubt that they were used by the Greeks and Romans to expel intestinal worms, and it is a matter of certainty that Arabian and Persian physicians have always prescribed them as an anthelmintic. During the war

both seeds and leaves were tried and found to be effective. Later Simonsen examined the leaves and flowering tops of *A. maritima* (*A. brevifolia* Wall.) growing in Chitral, Afghanistan, and Baluchistan, and obtained from 0 to 1 per cent of santonin, the amount being greater when the flowers are just appearing.

Arabic: Afsanthinulbarh, Sariqun, Shih, Shiharmani—; *Bhotia*: Sefedpurcha—; *Bombay*: Kiramaniova—; *Catalan*: Donsell mari—; *English*: Drooping Sea Wormwood, English Sea Wormwood, French Sea Wormwood, Levant Sea Wormwood, Roman Wormwood, Santonica, Sea Mugwort, Sea Wormwood, Wormseed—; *French*: Absinthe maritime, Armoise maritime—; *Gujerati*: Chhuvariajamoda, Kirmanidechi—; *Hindi*: Ajavayana, Chhuari—; *Indo-China*: Chi nai—; *Knani*: Zher—; *Marathi*: Kirmaniova, Surabandi—; *Persian*: Afsanthinulbarh, Darmaneh, Sariqun, Shih—; *Sanjawi*: Tarkha-sperah—; *Sanskrit*: Chhara, Chauhara, Gandha, Jantunashana, Khurapushpika, Parasi, Yavani, Yavaniya—; *Spanish*: Ajengo maritimo—; *Tehran*: Dharmane—; *Urdu*: Darmanah—.

6. **Artemisia persica** Boiss. is found at 9,000-14,000 ft. in Western Tibet, whence it extends to Afghanistan, Southern Persia, and Kurdistan.

The plant is used as a tonic, febrifuge, and vermifuge.

Arabic: Afsantinulbarh, Sariqun, Shih—; *Gujerati*: Paidesidauno—; *Maithi*: Davana—; *Persian*: Afsantinulbarh, Sariqun, Shih—.

7. **Artemisia sacrorum** Ledeb. occurs in Western Tibet and Kunawar. It is found in Kumaon on the interior ranges bordering Tibet between 10,000 and 12,000 ft. It extends to Dauria, Siberia, Central and South Russia.

The plant is given to horses in affections of the head.

Bhotia: Kalapurcha—; *Ladak*: Burmack, Tatwen—; *Punjab*: Burnak, Chumbar, Jau, Munya, Niurtsi, Tatwen, Zbur—.

8. **Artemisia scoparia** Waldst. and Kit. occurs in Western Tibet at altitudes of 7,000-12,000 ft., in the Western Himalaya from Kashmir to Lahul at 5,000-7,000 ft., in Sind, in the Punjab, in the Upper Gangetic Plain. Eastwards it extends to China and Japan, westwards to Afghanistan and Central Europe.

In the Punjab the infusion is given as a purgative, and the smoke is considered good for burns.

At Las Bela the plant is used as a cure for pain in the ear.

Baluchi: Gwataq—; *Bombay*: Churisaroj, Danti—; *Brahui*: Jir, Khisunjir, Luling—; *Las Bela*: Gajar—; *Punjab*: Biur, Dona, Durunga, Jhan, Lasaj, Marua, Pilajau—.

9. **Artemisia Siversiana** Willd. is found at 8,000-10,000 ft. in the Western Himalaya from Kashmir to Lahul, and at 12,000-14,000 ft. in Western Tibet. It extends to China whence it spreads westwards to South Russia.

The plant is much used in India where it is considered tonic, deobstruent, febrifuge and anthelmintic. It is applied externally as a discutient and antiseptic.

The hakims prescribe the drug freely.

The plant is also held in great esteem by the vaidas and its place in Ayurveda is undisputed.

Arabic : Afsantin—; *Bengal* : Dana, Dona—; *Bombay* : Downa—; *Canarese* : Davana—; *Gujerati* : Damro—; *Hindi* : Dauna—; *Marathi* : Davana, Rana-davana—; *Persian* : Afsantin—; *Sanskrit* : Agnidamanaka, Bahukantaka, Brahmajata, Damana, Damanaka, Damani, Dandi, Danta, Devashckhara, Gandhotkata, Guchhaphala, Jatila, Kshudradussparsha, Kshudrakantakai, Kulapatra, Kulapatraka, Madanaka, Muni, Munipatra, Panduraga, Patri, Pavitrika, Pundarika, Pushpachamara, Tapasaptri, Tapaswipatra, Tapodhana, Vanadamanaka—; *Urdu* : Afsantin—.

10. ***Artemisia vulgaris*** Linn. is found throughout the mountainous districts of India, ascending up to 5,000-12,000 ft. in the Western Himalaya, and up to 5,000-8,000 feet in Sikkim, the Khasia, Ava and Martaban Mountains. It grows at Mount Abu, in Marwar, and on the Western Ghats, from the Konkan southwards to Ceylon. It extends to temperate Europe and Asia, to Siam and Java.

The herb has emmenagogue and antispasmodic properties; the root is tonic and antispasmodic.

The plant is considered to be a valuable stomachic, deobstruent, and antispasmodic; it is prescribed in infusion and electuary in cases of obstructed menses and hysteria. Externally it is used in fomentations given in skin diseases and foul ulcers as an alterative.

The expressed juice is used in diseases of children. It is applied to the head of young children for the prevention of convulsions.

The leaves and tops are administered in nervous and spasmodic affections connected with debility, in asthma and diseases of the brain. In Persia, in Afghanistan, and throughout India, a strong decoction is given as a vermisuge, and a weak one to children in measles. An infusion is given as a tonic.

The plant is much used medicinally in Indo-China, where the leaves and the flowers are considered as aromatic, emmenagogue, stomachic, antispasmodic, and anthelmintic. The boiled leaves are used as a poultice in headache; dried and cut into small fragments they are used to cauterize wounds.

In China, Japan and Indo-China inflammable cones or 'moxa' are obtained by grinding the leaves in a stone mortar with water, separating the coarser particles, and drying what remains. Moxibustion, or the method of cauterizing the skin by burning, is resorted to for a very large number of diseases, from itch to sterility.

In Annam the leaf is used in haemorrhage: epistaxis, blood vomiting, haematuria. It is also recommended for metrorrhagia, dysentery, intestinal and urinary troubles. It is highly praised as a vermicide. It is used in eczema, herpes, and purulent scabies. In Malaya the leaves are employed as a carminative and haemostatic.

The tonic and stomachic properties of the plant are well known in the Philippine Islands. An infusion of the leaves is commonly used as an emmenagogue.

The plant is prescribed by Sushruta in the treatment of snake bite and scorpion sting; but that the plant is not an antidote

to either snake or scorpion venom has been experimentally demonstrated by Caius and Mhaskar.

Anglo-Saxon: Wyrmwyrt—; *Annam*: Bang dai, Benh thao, Cuu thao, La ngai, La ngai cao, La ngai cuu, La thuoc cuu, Ngai diep, Thuoc cuu, Y thao—; *Arabic*: Isteraj—; *Bombay*: Nagdona—; *Canarise*: Davana, Manjipatri—; *Catalan*: Altimira—; *Chinese*: Ai—; *Ducan*: Dawan, Randawan—; *Dehra Dun*: Samri, Sarmi—; *Dutch*: Bijoet, Sint Jans Gordel, Sint Jans Kruid—; *English*: Felon Herb, Felon Wort, Fleabane, Indian Wormwood, Maidenwort, Motherwort, Mugwort, St. John's Plant—; *French*: Armoise, Artémise, Ceinture de Saint Jean, Couronne de Saint Jean, Encens, Encens de mas, Fleur de Saint Jean, Herbe à cents gouts, Herbe de la Saint-Jean, Herbe de Saint Jean, Herbe Saint Jean, Remise—; *German*: Alsei, Beifuss, Beiposs, Besenkraut, Bibes, Biboth, Bibs, Biefoth, Biermersch, Buck, Budschen, Kampferkraut, Roterbock, Sant Johannis Guertel, Weiberkraut, Wiesen-kraut, Wildes Wurmkraut, Wurmtod—; *Garhwal*: Kunja—; *Greek*: Artemisia—; *Guam*: Yerba de Santa Maria—; *Hindi*: Dona, Gathivana, Majtari, Mastaru, Mastru, Nugduna—; *Indo-China*: Cuu ngai da, Lau cao, Ngai, Ngai cuu, Thuoc cau, Thuoc cuu, Yomogi—; *Italian*: Amarella, Artemisia, Canapaccia, Assenzio di siepe—; *Japanese*: Yomogi—; *Malaya*: Ai, Chi ai, Khee ngai, Ki ai, Ngai—; *Malayalam*: Appa, Damanakam, Kattuchatti, Makkippu, Mashipatri, Nilampala, Rirunittipacha—; *Marathi*: Gathona, Surband—; *Nepal*: Titapat—; *Pacific Coast*: Common Mugwort, Felon-herb, Green Ginger, Motherwort—; *Persian*: Absanthin, Absentin, Afsantin, Afsintin rumi—; *Philippines*: Santa Maria, Yerba de Santa maria—; *Punjab*: Alsuntin, Banjiru, Buimadaran, Chambra, Puujan, Taikha, Tataru, Ubusha—; *Roumanian*: Pelin negru, Pelinita—; *Russian*: Cherdonilnik—; *Sanskrit*: Barha, Barhikusum, Barhipushpa, Granthika, Granthiparna, Granthiparnaka, Guchhaka, Gutthaka, Kakapushpa, Kukura, Nagadaman, Nilapushpa, Saraparni, Shuka, Shukabarha, Shukachhada, Shukapuccha, Sthauneya, Sugandha, Svaramaguchhaka, Tailaparnaka, Vnyadamanaka, Vishirnakhya—; *Saora*: Adavidhavanamu—; *Spanish*: Artemisa, Artemisia—; *Tagalog*: Camaria, Tinisas—; *Tamil*: Mashibattiri, Tirunama—; *Teheran*: Absint—; *Telugu*: Davanamu, Mashipatri—; *Uriya*: Doyona, Gondhomaro, Nagodoyona—.

ASTER

The genus includes 400 species inhabiting mostly the northern temperate regions of the world.

The following species are used medicinally in China—*A. fastigiatus* Fisch. and Max., *A. scaber* Thunb., *A. tataricus* Linn. f., *A. trinervius* Roxb.—; in Indo-China—*A. tataricus* Linn., *A. trinervius* Roxb.—; in South Africa—*A. erigeroides* Harv., *A. filifolius* Vent., *A. hispidus* Bkr., *A. serrulatus* Harv.—; in California—*A. puniceus* Linn.—

Aster trinervius Roxb. occurs in the Central and Western Himalaya, Nepal, Sikkim at 5,000—7,000 ft., the Mishmi Mountains, the Khasia Hills at 3,000—6,000 ft. Thence the plant spreads over to North China and Japan.

The Chinese use the root for coughs and pulmonary affections, and in the treatment of malaria and haemorrhages.

Cantonese: Tsz uen—; *Chinese*: Ma Lan—; *Indo-China*: Ma lan—; *Malaya*: Tsz yoon—.

BIDENS.

The genus includes 150 cosmopolitan species, chiefly American.

B. bipinnata Linn. is used medicinally in West Africa; *B. pilosa* Linn. in China, Indo-China, North America, Brazil, Gold Coast,

Kenya, Tanganyika, and South Africa; *B. tripartita* Linn. also is used in China, and *B. graveolens* Mart. in Brazil.

Achenes cuneiform, tip truncate 2. *A. tripartita*.
Achenes long, slender, narrowed from the middle to the top. 1. *A. pilosa*.

i. *Bidens pilosa* Linn. is found throughout India, Ceylon, and most of the warm countries.

In Indo-China the dried flower buds ground and mixed with alcohol are used as a mouth wash in toothache. For sore eyes the pounded leaves are applied over the eyelids.

In Gold Coast and in Lagos the juice of the leaves is commonly squeezed into the eyes or the ears to cure eye complaints or ear complaints. In the latter case the leaves are first warmed in water with pepper. It is also used as a styptic to stop bleeding from a wound.

The Zulus chew the young shoots for the treatment of rheumatism. They also administer the powdered leaf in water as an enema for abdominal troubles and rub the burnt seeds into incisions on the sides for the relief of pain. The flower is a remedy for diarrhoea, and an infusion of the leaf and root a remedy for colic.

The leaves are used in Brazil as a styptic in stopping the flow of blood, and as a vulnerary. They are applied to foul ulcers and swollen glands. In Colombia the infusion is used as a sudorific.

Afrikaans: Duivelskerwel, Wevenaar—; *Antioquia*: Masiquia—; *Australia*: Black Fellows—; *Bogota*: Chipaca—; *Ceylon*: Ottupillu—; *Chinese*: Kuei Chen Ts'ao—; *English*: Beggar Ticks, Bur Marigold, Spanish Needles, Sweethearts—; *Ewe*: Dzani pipi—; *Gold Coast*: Black Jack—; *Gujerati*: Phusium, Samarakokadi—; *Iloilo*: Tubactubac—; *Indo-China*: Cuc ao, Quay cham thao, Tu to hoan—; *Kikuyu*: Michegi—; *Krepi*: Adzrorkpii—; *Krobo*: Dsetshi—; *Lagos*: Abere oloko, Akesinmaso—; *Lepcha*: Mung-gu tuk-tsang, Tuk-tsang mung-ayap—; *Malay*: Rumput juala—; *Mano*: Zikilli wissi—; *Mauritius*: Ville-bague—; *Mende*: Tombolo, Tombo-makei—; *Meru*: Rathangi—; *Nandi*: Kipkoleit—; *South Africa*: Beggarsticks, Black Jack—; *Suto*: Moonyane—; *Tinne*: Ebamp—; *Twi*: Ananse mpaane, Dwirantwi, Gyniantwi—; *Yoruba*: Abere-oloko—; *Zulu*: uQadolo—.

2. *Bidens tripartita* Linn. occurs in Western Tibet, and in the marshes of Central and Western Himalaya from Nepal to Kashmir at altitudes of 3,000-5,000 ft. It is distributed to Northern Asia and Japan, and westwards to North Africa, Western Europe, and North America.

The Chinese use the plant in chronic dysentery and for eczema.

Chinese : Lang Pa Ts'ao—; *English* : Bur Marigold, Water Agrimony—; *Greek* : Agria katephedia—.

BLUMEA.

The genus is eminently characteristic of India, and the species may be called the Groundsels of that country. The species number about 80; they are tropical and subtropical Asiatic, African, and Australian.

B. aurita DC. is used medicinally in Gold Coast.

- A. Heads many, villous, small. Leaves thick, fomentose beneath ... 5. *B. laceria*.
 B. Heads few, small, on long slender peduncles of dichotomous cymes ... 4. *B. ciantha*.

- C. Heads very numerous, large or small. Leaves very large.
1. Pappus white 2. *B. chinensis*.
 2. Pappus red
 - a. Tall shrub, camphoraceous. Leaves thick usually silky above 1. *B. balsamifera*.
 - b. Leaves 8-18 in. long, very woolly white beneath puberulous above 3. *B. densiflora*.
 - c. Leaves 6-10 in. long, stiff, shining, quite glabrous 6. *B. mynocephala*.

1. **Blumea balsamifera** DC. is easily recognised by its strong smell of camphor. It is found in Tropical Himalaya, Nepal, Sikkim at 1,000-4,000 ft., Assam, the Khasia Hills, Chittagong, and Burma. It is very common in open places in the whole Malay Peninsula. It is also common in Java.

A warm infusion acts as a pleasant sudorific, and the decoction is a useful expectorant.

In Indo-China the leaves are considered to be stomachic, and antispasmodic, and they are used in leucorrhoea. In Cambodia they are used externally in scabies.

Taken internally the decoction of the leaves is an excellent diaphoretic in bronchitis. In Java and China it is given as an expectorant. It is stomachic, antispasmodic, emmenagogue, anti-septic. As a fumigation it is much used in the Philippine Islands for rheumatism and headache.

The leaves are officinal in Holland.

Burma: Ponmathein—; *Cambodia*: Baimat—; *China*: Ai Na Hsiang—; *Dutch India*: Semboeng octan—; *English*: Nagal Camphor—; *French*: Camphrée—; *Gujerati*: Kalahad—; *Hindi*: Kakaronda—; *Ilocano*: Sob sob—; *Indo-China*: Bai mat, Dai bi, Tu bi xanh—; *Malay*: Chapapu, Sembong—; *Marathi*: Bhangeruda—; *Pampangan*: Sambon—; *Tagalog*: Sambon, Sambong, Sambung—; *Visayan*: Alibhon, Alibun, Ayoban, Gabuen, Gintingintin, Guintinting, Guitinguitin, Hamlibon, Lacadbulan, Lacadbulan, Lalacdanan—.

2. **Blumea chinensis** DC. is found in the Eastern Himalaya, Sikkim and Bhutan at 2,000—4,000 ft., Assam, the Khasia Hills, and Penang. It is not rare in the woods of the Malay Peninsula, whence it spreads over to Java and Southern China.

The leaves or leafy stalks are used in Malaya as a stomachic, antispasmodic, and diaphoretic.

Chinese: Chin Li Ming—; *Malaya*: Kow lee meng, Tombak-tombak—.

3. **Blumea densiflora** DC. occurs in Tropical Himalaya, Sikkim, Assam, the Mishmi, Naga, and Khasia Hills at altitudes of 2,000—4,000 ft. It is found in Tavoy, and extends to the Malay and Fiji Islands.

The plant yields camphor. Its leaves are occasionally used as a sudorific.

Burma: Phummasin, Pungmatheing—.

4. **Blumea eriantha** DC. is found in Bundelkhand, Konkan, Deccan, the Western Ghats, the South Mahratta Country. It probably occurs on the West Coast of the Madras Presidency.

The juice of the plant is administered as a carminative, and the herb used along with the leaves of *Vitex Negundo* and *Careya arborea* for fomentations. A warm infusion is given as a sudorific in catarrhal affections, cold it is considered to be diuretic and emmenagogue.

Marathi: Nimurdi—.

5. **Blumea lacera** DC. occurs throughout the plains of India, from the north-west ascending to 2,000 ft. in the Himalaya, to Travancore and Singapore. It is a common roadside weed in Ceylon and Malaya. It is distributed to the Malay Islands, Australia, China, and tropical Africa.

The plant is described by Ayurvedists as hot, pungent, and bitter; antipyretic; good for bronchitis, diseases of the blood, fevers, thirst, and burning sensations. The root kept in the mouth is said to cure diseases of the mouth.

In the Konkan the plant is used to drive away fleas and other insects. It is prescribed as an antiscorbutic in West Africa.

The root mixed with black pepper is given in cholera.

The expressed juice of the leaves is used as an anthelmintic, febrifuge, astringent, and diuretic; mixed with black pepper, it is given in bleeding piles.

Arabic: Kamafitus—; *Bengal*: Burasuklung, Kukurmuta, Kukursunga—; *Bombay*: Nimurdi—; *Burma*: Maiyagan—; *Deccan*: Divarimulli, Janglikasni, Janglimulli—; *Golungo Alto*: Quitocho antiscorbutico—; *Gujerati*: Kalhar, Kokarunda, Filo kapurio—; *Hindi*: Janglimuli, Kakronda, Kukkurbanda—; *Konkan*: Numurdi—; *La Reunion*: Lastron bâtarde—; *Malay*: Lumai hitam—; *Marathi*: Bhamsurda, Kukurbanda—; *Mundari*: Marangkuru—; *Porebunder*: Kapurio, Pilichanchadamar—; *Sanskrit*: Kukkuradru, Kukundara, Mriduchhada, Suks-hmapatra, Tamrachuda—; *Tamil*: Kattumullangi, Narakkarandai—; *Telugu*: Advimulangi, Karupogaku—.

6. **Blumea myriocephala** DC. is found in the Sikkim Himalaya at an altitude of 2,000 ft., in Assam, Chittagong, Sylhet, and Burma. It occurs in the mountain forests of the Malay Peninsula.

The leaves are used as a sudorific in Indo-China; they are given in bronchitis and in aphthae.

Indo-China: Xang song, Xuong song—.

BOLTONIA.

The genus consists of 12 North American and North subtropical Asiatic species.

Boltonia indica Benth. is found in the Khakyen Hills of Upper Burma. It extends to China and the Malay Islands.

In Indo-China the plant is considered tonic, stomachic, and antipyretic.

Indo-China: Hai nhí cuc—.

CALENDULA.

The genus includes 15 species, natives of Central Europe and the Mediterranean region, as far as India, the Canaries; cultivated and naturalised elsewhere.

Ligules sulphur-coloured; achenes all curved, marginal dorsally echinate beaked, inner dorsally muricate .. 1. *C. arvensis*.

Ligules many, bright orange yellow; achenes all curved boat-shaped dorsally muricate not beaked, outer larger ventrally crested scarcely beaked 2. *C. officinalis*.

1. **Calendula arvensis** Linn. is a doubtful native of India; found in Kashmir; distributed over Western Asia and Southern Europe; naturalised in South America, Australia and Japan.

The plant is used medicinally in Spain; the leaves are considered sudorific; the flowers are reputed stimulant, antispasmodic, and emmenagogue.

Catalan: Galdirons, Llevagat, Llevamal, Llevamans—; *French*: Petit souci, Souci des champs, Souci des vignes—; *Malta*: Field Marygold, Calendula, Calta, Fior-rancio, Sufieira—; *Spanish*: Calendula silvestre, Flor de cada mes, Maravilla silvestre, Yerba del podador—.

2. **Calendula officinalis** Linn. is a native of the Mediterranean introduced in India and run wild. It is found in the fields of Punjab and Sind, extending to Afghanistan and westwards to South Europe.

The plant is signally valued for healing wounds, ulcers, burns, and other breaches of the skin surface; it is a precious vulnerary. The dried florets are vulnerary, antiemetic, bitter tonic, febrifuge, anthelmintic, and stimulant to wounds and ulcers.

The plant, especially its flowers, was used on a large scale by the American surgeons to treat wounds and injuries sustained during the last civil war, and obtained their warmest commendation. It quite prevented all exhausting suppurative discharges and drainings.

In Europe the herb is chiefly used as a local remedy. Its action is stimulant and diaphoretic. Given internally, it assists local action and prevents suppuration. The infusion of one ounce to a pint of boiling water is given internally, in doses of a tablespoonful, and externally as a local application. It is useful in chronic ulcer, varicose veins, etc. The plant was formerly considered to have much value as an aperient and detergent in visceral obstructions and jaundice.

The leaves, eaten as a salad, have been considered useful in the scrofula of children. The expressed juice has been given in cases of costiveness and proved very efficacious. Snuffed up the nose it excites sneezing and a discharge of mucus from the head. It has also been found useful as an extirpator of warts.

It has been asserted that a flower, rubbed on the affected part, is an admirable remedy for the pain and swelling caused by the sting of a wasp or bee. A lotion made from the flowers is most useful for sprains and wounds, and a water distilled from them is good for inflamed and sore eyes.

An infusion of the freshly-gathered flowers is employed in fevers, as it gently promotes perspiration and throws out any eruption—a decoction of the flowers is much in use among country people in England as a posset drink in measles and smallpox, a widely administered remedy and one of the few which everybody seems to know. Marigold flowers are in great demand for children's ailments.

Druggists now make a medicinal tincture which is advised as a sudorific stimulant in low fevers, and to relieve spasms. A saturated tincture of the flowers, when mixed with water, promotes the cure of contusions, wounds, and simple sores or ulcers; also the extract will allay chronic vomiting. One drop of the tincture with two grains of powdered borax when sprayed into the ear is very useful if a discharge has become established therefrom.

Anglo-Saxon: Merso-meargealla—; *Burma*: Htattaya—; *Catalan*: Clavellina de mort, Clavellines de mort, Gojato, Gojats, Graugets—; *Chinese*: Chin Chan Ts'ao—; *Danish*: Almindelige koebblomme—; *Dutch*: Atrikaantje goudsbloem, Goudsbloem, Tamme goudeboom—; *English*: African Marigold, Calendula, Common Marigold, Garden Marigold, Golds, Marigold, Mary Gowles, Pot Marigold, Ruddes—; *French*: Fleur de tous les mois, Souci, Souci cultivé, Souci des jardins—; *German*: Butterblume, Dannblaume, Dotterblume, Faerberblume, Gaehl, Gaehlgölling, Gartringel, Gelken, Gilkenblume, Goeldeke, Goeling, Goldblume, Goldrose, Gugelkopt, Hauswirbel, Huehnernelke, Ingblume, Kohlblume, Kotblume, Morgenroete, Rinderblume, Ringelblume, Ringelken, Ringelrose, Sonnenblume, Sonnenrose, Studentenblume, Totenblume, Wagenblume, Warzenkraut, Wegroeslein, Zunenwirvel—; *Greek*: Chamobyoreta—; *Italian*: Calendula, Calendula ortense, Fiori d'ogni mese, Fiorrancio, Furrancio—; *Kurdish*: Hamaishabahar—; *Pacific Coast*: Garden Marigold, Goldbloom, Holligold, Marigold, Mary-bud—; *Polish*: Nogieter—; *Portuguese*: Calendula ortense, Maravilha bastardia—; *Punjab*: Aklelumulk, Saldbargh, Zergul—; *Roumanian*: Galbinea, Hilimica—; *Russian*: Nogotki—; *Spanish*: Calendula, Calendula officinal, Flor del muerto, Flor de muerto, Maravilla, Mercaderes dorados, Mercaderes reales—; *Swedish*: Ringblomma—; *Turkish*: Qarah koz—; *Uruguay*: Flor de la virreina—; *Yemen*: Zobedje—.

CARDUUS.

The genus includes about 80 species, natives mostly of the Mediterranean region, but extending from Europe to Japan.

C. crispus Linn. is used medicinally in China, *C. nutans* Linn. in India.

Carduus nutans Linn. is found in Western Tibet at an altitude of 13,000 ft., in the Western Himalaya from Kashmir to Simla, and in the Punjab. It extends to Northern Asia and westwards through Baluchistan and Persia to North Africa and Western Europe.

The flowers are considered febrifugal in Sind and in the Punjab. In Kashmir they are used to purify the blood.

English: Musk Thistle, Nodding Thistle—; *Kashmir*: Gulibadaward—; *Punjab*: Badaward, Kanchhari, Tiso—; *Urdu*: Gulebadáward—; *Uruguay*: Cardo—.

CARPESIUM.

The genus consists of about 10 species in South Europe and in temperate and subtropical Asia.

Leaves sessile, never truly petioled, lanceolate acuminate quite entire or serrate. Heads sessile inserted along the whole length of the branches 1. *C. abrotanoides*. Leaves shortly petioled elliptic-lanceolate obtuse sinuate-toothed. Heads terminal drooping with broad leafy bracts. 2. *C. cernuum*.

1. ***Carpesium abrotanoides*** Linn. is found in the Temperate Himalaya, from Kashmir at 5,000-1,000 ft. to Sikkim at 8,000-10,000 ft. It is distributed to North Persia and Austria, and to China and Japan.

The root, the leaf, and the seed are used medicinally in China. They are said to be diuretic and anthelmintic.

In Indo-China the seeds are considered laxative and bechic.

Chinese: Hao Shih, T'ien Ming Ching—; *Indo-China*: Cau nhí thai, Thien mong tong—.

2. ***Carpesium cernuum*** Linn. is one of the commonest and most variable Himalayan plants. It abounds in the Temperate Himalaya, the Khasia Hills, and the Nilghiri Mountains. It is distributed from the Caucasus to France, Java, and Japan.

The herb is used in China as an astringent, diuretic, and anthelmintic.

Chinese: Ho Shih—.

CARTHAMUS.

The genus includes about 25 species, natives of the Mediterranean region, Central Europe, India, Abyssinia and the Canaries.

- A. Pappus made of scabrous toothed scales, the inner ones being thrice as long as the achene 1. *C. lanatus*.
- B. Pappus absent.
 - 1. Leaves entire and unarmed or spinulose-serrate ... 3. *C. tinctorius*.
 - 2. Leaves oblong or oblong-lanceolate; lower shortly spinulose-toothed, upper half-amplexicaul, very spinous 2. *C. oxyacantha*.

1. ***Carthamus lanatus*** Linn. is found in Kashmir at 5,000-6,000 ft. It occurs in the Mediterranean region, Central Europe, Abyssinia, Madeira, the Canaries.

The plant is used medicinally in France as a sudorific, febrifuge, and anthelmintic.

English: Blessed Thistle, Distaff Thistle, Woolly Carthamus, Yellow Distaff Thistle—; *French*: Carthame laineux, Chardon bénit des Parisiens—; *Maltese*: Xeuk il far, Xeuc ta Cristu—.

2. ***Carthamus oxyacantha*** Bieb. occurs in the Punjab, whence, through Baluchistan and Afghanistan, it extends westwards to the Caucasus,

The oil extracted from the seeds is used medicinally in the Punjab as a dressing for bad ulcers and as a remedy for itch.

English: Wild Safflower—; *Hindi*: Kantiari, Karar, Kharara, Poli, Polian—; *Iraq*: Kassub asfar, Suslair, Summaina—.

3. ***Carthamus tinctorius*** Linn. is cultivated throughout a large part of India, Afghanistan, Persia, Syria, Egypt, and Southern Europe.

This plant is the Kusumbha of Sanskrit writers, a well known Hindu medicinal drug.

Mahomedan writers too ascribe many virtues to the plant.

The action of the flowers is laxative and diaphoretic. In domestic practice these flowers are used in children's and infants' complaints—measles, fevers, and eruptive skin complaints. An infusion is made of $\frac{1}{2}$ oz. of the flowers to a pint of boiling water taken warm to produce perspiration.

In China and Indo-China the flowers are given in dysmenorrhoea and paralysis as a tonic and emmenagogue. In the Philippine Islands they are employed as a cure for jaundice.

The powdered seeds made into a poultice, are used to allay inflammation of the womb after childbirth. In Sind they are employed as a cooling medicine; they are sometimes boiled and made into a gruel. They are considered to be diuretic and tonic by the natives of the Punjab. In China and Indo-China they are reputed purgative.

Koman in Madras administered a decoction (1 in 20) of the powdered seeds to cases of constipation. The action was very mild, and in the majority of cases it did not produce the desired effect.

The oil from the seeds is considered a mild purgative in Sind. It is used as a dressing for bad ulcers, and as a liniment in rheumatism. In Bengal it is considered by the ryots as a valuable remedy for itch; a cure is said to be effected after three to six applications. The charred oil is used for healing sores and for rheumatism; as a veterinary medicine it occasionally finds use in healing sores on cattle.

The young green plant is said to be very efficacious in colds; it is believed to keep the system warm.

Safflower, in combination with other drugs, is prescribed for scorpion sting; but Caius and Mhaskar have experimentally shown that it is not an antidote to scorpion venom.

Arabic: Akhariza, Bazr-el-abris, Hab-ul-asfar, Hariz, Kirtum, Kurtum, 'Usfar, Za'farān—; *Bengal*: Kajirah, Kusamphul, Kusum, Kusumbha—; *Bombay*: Kardai, Karophi, Kusumba—; *Burma*: Heboo, Hshu, Su, Suban, Supan—; *Canarese*: Kossumba, Kusambe, Kusumba—; *Catalan*: Safrá bort, Safranó—; *Chinese*: Hong Hoa, Hong Lan Hoa, Hung Lan Hua—; *Cutch*: Kusumba—; *Dutch*: Basterd Saffraan, Wilde saffraan—; *Deccan*: Kusumb—; *Egypt*: Gartoom, Kurtim, Osfar, Qortom—; *English*: African Saffron, American Saffron, Bastard Saffron, Dyer's Saffron, False Saffron, Parrot Seed, Safflower, Wild Saffron—; *French*: Carthame, Cnique, Safran bâtarde, Safran d'Allemagne, Safranon, Carthame des teinturiers, Safran faux—; *German*: Gartensafran, Falschesafran, Farberdistel, Safflor, Wildersafran—; *Greek*: Atractos, Atractylis, Knikos—; *Gulian*: Tokhme-Kafisheh, Tukm-i-kajrah, Tukm-i-kazirah—; *Gujerati*: Karada, Kusumbo—; *Hamadan*: Kaufsha, Qushon—; *Hindi*: Barre, Karrah, Kasumba, Kussum, Kusumba—; *Indo-China*: Daccam, Hong hoa,

Hong lam hoa, Rum—; *Iraq*: Qurtum—; *Italian*: Cartamio, Croco ortense, Zafferano saracinesco, Zafrone—; *Konkani*: Kusbo—; *Languedoc*: Grano de perrouquet—; *Malaya*: Hong fah, Hsi hung hua, Hung hua, Hung lan hua, Sai hong fah—; *Malayalam*: Chendurakam—; *Malta*: Bastard Saffron, Zafferanone, Ghosfor—; *Manipur*: Galapmachu—; *Marathi*: Kadaya, Kararhi, Kardai, Kasdi, Kurdi, Sadhi—; *Mauritius*: Carthame, Safran bâtarde—; *North-Western Provinces*: Barre, Kar—; *Oceania*: Kassoumbo—; *Pampangan*: Cachumba, Casubha, Castumba—; *Persian*: Gulekafshah, Gulemaskar, Kasakdanah, Kazhirah, Muasfir, Quortum—; *Philippines*: Azafran de la tierra—; *Portuguese*: Acafrao, Cartamo—; *Punjab*: Kar Karar, Kasumbha, Kurtam, Kusam, Kushumbha, Ma, Safir—; *Rajputana*: Bundi—; *Roumanian*: Brandusa de tvamna—; *Russian*: Saflor—; *Sanskrit*: Agnishikha, Gramya-kunkuma, Kamalottara, Kamlottama, Kukkutashikha, Kusumba, Lohita, Maharajana, Padmottara, Papaka, Pita, Rakta, Vanishikha, Vasraranjana—; *Sind*: Khoimbo, Quortum—; *Spanish*: Alazor, Azafran bastardo, Azafran romi, Azafranillo de Mejico, Azafranillo de papagayos—; *Sudan*: Essfar, Kurtum—; *Swedish*: Saffler—; *Syria*: Kashni—; *Tagalog*: Biri, Casabha, Casubha, Castumba, Catsumba, Lago—; *Tamil*: Chendurukam, Kusumba, Sendurgam—; *Telugu*: Agnisikha, Kushumba, Kusumba—; *Turkish*: Kantawaras—; *Urdu*: Karha, Kusum—; *Uruguay*: Azafran bastardo, Azafran falso—; *Visayan*: Casabha—.

CENTAUREA.

The genus includes 600 species, mostly natives of the Mediterranean region, Central Europe and Western Asia, with a few North and South American and one Australian. The *Centaurea* are immigrants from the west into India and, except perhaps for *C. iberica* Stev. and *C. phyllocephala* Boiss. are visitors rather than even denizens.

C. calcitrappa Linn., *C. Centaurium* Linn., *C. cyanus* Linn., *C. jacea* Linn., *C. montana* Linn. are used medicinally in Europe; *C. Behen* Linn. in Persia; *C. alexandrina* Del., *C. praecox* Oliv. and Hiern., *C. rhizocephala* Oliv. and Hiern. in West Africa.

C. solstitialis Linn. is reputed poisonous to live stock when matured.

- | | | | | | |
|--|-----|-----|-----|-----|----------------------------|
| A. Flowers blue | ... | ... | ... | ... | z. <i>C. cyanus</i> . |
| B. Flowers purple or pink, very rarely white. | | | | | |
| 1. Involucral bracts with narrow membranous margins terminating in a long strong spreading spine with short lateral ones at its base | ... | ... | ... | ... | 1. <i>C. calcitrappa</i> . |
| 2. Involucral bracts ovate-rotund and oblong, herbaceous, cuneolate with hyaline tomentose membrane | ... | ... | ... | ... | 3. <i>C. picris</i> . |

1. *Centaurea calcitrappa* Linn. is found in the Punjab and Kashmir, ascending to 3,500 ft. It also occurs in Mysore. It extends to Asia Minor, Central and South Europe, North and Tropical Africa.

The Arabs apply the bruised leaves to the head in cephalgia.

In Europe the powdered root has long been considered a cure for fistula and gravel, and the seeds are made into powder and drunk in wine as a remedy for stone.

Arabic: Morrer, Shok—; *Catalan*: Cart estrellat, Floravia, Herba espitlera—; *English*: Star Thistle—; *French*: Centauree chausse-trappe, Chardon étoilé, Chausse-trappe—; *German*: Flockenblume, Sterndistel, Sternflockenblume—; *Italian*: Calcatrepo, Calcentreppo, Calcatrepolla, Calcatrippa, Ipopesto, Ippofresto—; *Malta*: Caltrops, Star-thistle, Calcatreppola, Ippofesto—; *Spanish*: Abrojo, Cardo estrellado, Trepacaballos, encarnado—.

2. **Centaurea cyanus** Linn. is found in corn fields and cultivated places of North-West India. It is distributed to the Caucasus and westwards to the Atlantic.

The florets are mildly astringent. A water distilled from them was formerly in repute for weak eyes; it was famous in France under the name of *Eau de Cusse-lunettes*.

Quoth Culpepper: 'The powder or dried leaves of the blue-bottle, or cornflower is given with good success to those that are bruised by a fall, or have broken a vein inwardly, and void much blood at the mouth'.

In modern herbal medicine the flowers are considered to have tonic, stimulant, and emmenagogue properties.

Catalan: Angelets, Blauets, Blauhet, Escombrera—; *Dutch*: Korenbloem—; *English*: Bachelor's Buttons, Blaver, Blaverole, Blawort, Blue Blawort, Blewball, Blewblow, Blueblaw, Blue-bonnets, Bluebottle, Bluebow, Blue-caps, Blue Poppy, Break-your-Spectacles, Brushes, Corn-binks, Corn Bluebottle, Corn-bottle, Corn Centaury, Cornflower, Cuckoo-hood, Hawdod, Hurt-sickle, Knobweed, Knotweed, Loggerheads, Thumble, Witch Bell, Witches' Thimble—; *French*: Aubefoin, Aubifoin, Aubiton, Aubitou, Barbeau, Barbot, Bavéolle, Blavelle, Blavéole, Blaverolle, Blavet, Blaveolo, Blavetta, Blavette, Bleuet, Bluet, Bluet des moissons, Boufa, Bouffa, Carconille, Casse-junettes, Centaurée barbeau, Centauré bleuet, Chevalon, Chevalot, Ciano, Cornaille, Cornillat, Cornille, Courourille, Créonille, Fleur de Zacharie, Le Chevalier, Péréole, Pérole—; *German*: Blaue Kornblume, Kornblume, Roggenblume, Tremse, Ziegenbein—; *Italian*: Battisegola, Fiordaliso—; *Romanian*: Albastrea, Dioc, Floarea gruiului, Ghioce, Sglavoc, Vinetea—; *Russian*: Vacilek, Vacilyok, Valoshky—; *Spanish*: Aciano, Azulejo, Escobilla, Flor celeste de sembrados, Flor del cielo espiñol, Liebrecilla menor—.

3. **Centaurea picris** Pall. is found in Sind, Baluchistan, Afghanistan, the Levant, Central and Southern Russia, Siberia, and the Altai Mounts.

At Wad in Jhalawan the plant is pounded in water and used to cure worms. In Loralai it is a cure for wounds of sheep, used if wolves tear them.

Brahui: Talkh kah—; *Harboi Hills*: Tulkha—; *Loralai*: Kurakh—; *Wad*: Talkhakao—.

CENTIPEDA.

The genus numbers 5 species, inhabiting Chile, Madagascar, tropical Asia, and Australia.

Centipeda robicularis Lour. is found in moist places throughout the plains of India and Ceylon. It is distributed over Afghanistan, Eastern tropical Asia, Australia, and the Pacific Islands.

The plant, either whole or in parts, is used medicinally in India, China, the Philippine Islands, and New South Wales.

The powdered herb and the minute seeds are used as a sternutatory. The drug is administered in ozoena, headaches, and colds in the head. It is considered a hot and dry medicine, useful in paralysis, pains in the joints, and worms.

The Mundas of Chota Nagpur snuff the crushed plant in fevers and colds. In the Punjab the herb is boiled to a paste and applied to the cheeks in toothache.

Vyas and Sinha have shown that the herb contains an alkaloid, a glucoside, and traces of saponin; the watery extract increases the force of contraction of the frog's heart, prolongs the systole, and causes heart block in larger doses.

Arabic: Afkar, Makandash, Uffarkakudush—; *Bengal*: Chhikni, Hanchetagacha, Hanchuti, Mechitta, Nagdowana, Nakkchikni, Pachittie—; *Bombay*: Nagdowana, Nakkchikni, Pachittie—; *Chinese*: Shih Hu Sui—; *English*: Sneezeweed, Sneezewort—; *Gujerat*: Chhikani—; *Hindi*: Nagdowana, Nakchhikni, Naklkchikni, Pachittie—; *Indo-China*: Co the, Thach ho tuy—; *Malaya*: Chikkana, Chhikika, Chu tsao, E tai shih, O tai shih, Pe kong chau, Shih u sui, Yoo pak seek—; *Marathi*: Nakashikani, Narasinkani—; *Mundari*: Acuara, Acusing—; *New South Wales*: Sneezeweed—; *Persian*: Gawejanah—; *Sanskrit*: Chhikkani, Chhikkika, Ghranadukhada, Kruranasa, Kshavaka, Kshavakrita, Sanvedanapatu, Tikshna, Ugra, Ugragandha—; *Santal*: Bediachim—; *Sind*: Afkar—; *Tagalog*: Harangan—; *Urdu*: Nakachhikani—; *Victoria*: Gukwonderuk—; *Visayan*: Harangan, Pissic—.

CENTRATHERUM.

The genus consists of 15 tropical species, mostly Asiatic, with four American and one Australian.

Centratherum anthelminticum O. Ktze. (= *Vernonia anthelmintica* Willd.) is found throughout India and Ceylon, often cultivated.

The plant, roasted in a room, or powdered and thrown about the floor, is believed to expel fleas.

The juice of the leaves is given to cure phlegmatic discharges from the nostrils.

In Hindu medicine the seeds have long been esteemed as one of the principal remedies for white leprosy and other skin diseases. The drug is powdered with an equal quantity of black sesamum, and a drachm of the powder is taken in the morning with tepid water after perspiration has been induced by exercise or exposure to the sun; the diet should consist of milk and rice. In leucoderma a decoction of emblic myrobalans and catechu is given with the powdered drug. Externally the seeds are used in skin diseases in a variety of forms, such as powder, paste, oil, infusion, juice.

On the Malabar Coast an infusion of the seeds is given for coughs and against flatulency. In Travancore the bruised seeds, ground up to a paste with lime juice, are largely employed as a means of destroying lice.

In the Konkan the seeds enter into the composition of a popular antiperiodic powder. In the Punjab they are considered febrifuge; they are also given in anasarca, and used for plasters for abscesses. In Ceylon they are recommended for fever convulsions.

European doctors practising in India consider the seeds a valuable tonic, stomachic, and diuretic.

The seeds are considered as powerfully anthelmintic in South India, and are also an ingredient of a compound powder prescribed in snake bites.

The author of the *Makhzan-el-Adwiya* says that the seeds are given internally to remove phlegm and worms from the intestines,

and that a poultice or plaster is used to disperse cold tumours. He concludes by stating that the drug is not often prescribed internally, as it is thought to have injurious effects, but that it is much used as a cattle medicine.

The seeds are used instead of quinine by the Mundas of Chota Nagpur. In paralysis of the legs the powdered seeds are applied externally. When the stomach of cattle swells, the powdered seeds are mixed in equal quantity with salt and soot from the fireplace. This is dissolved in water with the addition of two capsules of Spanish pepper, and given as a drink.

Wrench (1919), Caius and Mhaskar (1923) have reported unfavourably of the seeds in the treatment of hookworm infection.

There is conflict of opinions as to the value of the seeds in the expulsion of roundworms; not only in the past, but also in more recent times. Whilst Koman (1919-20) finds the seeds to possess considerable ascaricidal properties, Caius and Mhaskar (1923) report very unsatisfactory results.

The seeds contain a rather large quantity of resin. This was tried in a number of cases of helminthic infections at the Carmichael Hospital for Tropical Diseases, Calcutta. It appears to have very little effect on the ascaris. It is, however, distinctly effective in threadworms infections. In several children to whom the resin powder was administered, threadworms were expelled in the stools in large numbers and the symptoms which are often very troublesome, such as nocturnal enuresis and grinding of the teeth, were relieved.

Mhaskar and Caius have shown experimentally that the seeds are not an antidote to either snake or scorpion venom.

Arabic : Atar-i-lal, Itr-i-lal, Kamun-e-bari—; *Bengal* : Babchi, Bapchi, Bukshi, Hakuch, Kaliziri, Somraj—; *Bombay* : Kalenjiri, Kalijiri—; *Canarese* : Kadujirage, Kadujirige, Kalajirige, Sahadevi—; *Deccan* : Kalajira, Kalijiri, Karviziri—; *English* : Purple Fleabane, Wild Cumin—; *French* : Herbe aux mouches—; *Gujerati* : Kadvojiri, Kalijiri—; *Hindi* : Bakshi, Bukshi, Kalijhiri, Kaliziri, Somraj, Vapchi—; *Kumaon* : Kalijiri—; *Malayalam* : Kalajirakam, Kattasiragam, Kattujirakam, Puvankuruntala—; *Marathi* : Kalajira Kalenjiri, Kalijiri, Karalye, Ranachajire—; *Mundari* : Karigiri, Karijiri, Karijuri, Piriti-judiring, Saoraj—; *Persian* : Atarjal, Irljal—; *Porebunder* : Kalijiri—; *Punjab* : Bukoki, Kakshama, Kalazira, Kaliziri, Malwabakshi—; *Sanskrit* : Agnibija, Aranyajiraka, Avalguja, Atavijiraka, Brihanyali, Kana, Kananajiraka, Krishnaphal, Kshudrapatra, Putiphali, Sahadevi, Somaraji, Tiktajiraka, Vakushi, Vanajiraka—; *Sinhalese* : Sanninaegam, Sanninasang, Sanninayan—; *Tamil* : Katchiragam, Kattuchiragam, Neychitti, Nirnochi, Sittilai—; *Telugu* : Adavijilakkatta, Garitilkamma, Nelavavili, Vishakantakamulu—; *Tulu* : Kalajrdari—; *Urdu* : Janglijiri—; *Uryia* : Somraj—.

CHRYSANTHEMUM.

The genus includes 180 species, natives of the northern hemisphere.

The following are used medicinally in Europe—*C. Balsamita* Linn., *C. cinerariaefolium* Vis., *C. Leucanthemum* Linn., *C. Parthenium* Bernh., *C. vulgare* Bernh.—; in Persia—*C. Marschallii* Aschers—; in China—*C. coronarium* Linn., *C. Decaisneanum* Max., *C. indicum* Linn., *C. sinense* Sab.—; in Indo-China—*C. indicum*

Linn., *C. sinense* Sab.—; in North America—*C. cinerariaefolium* Vis., *C. Leucanthemum* Linn.

Annual	...	...	...	...	...	1. <i>C. coronarium</i> .
Perennial	...	...	..	..	...	2. <i>C. indicum</i> .

1. ***Chrysanthemum coronarium*** Linn. is a native of the Mediterranean region, planted in Indian gardens.

The Yunanists consider the bark a purgative useful in syphilis; they apply the leaves topically to lessen inflammation.

The people of the Deccan administer the plant in conjunction with black pepper in gonorrhoea.

Arabic : Adharyun—; *Assam* : Pithogarkah—; *Bengal* : Guldaudi—; *Bombay* : Seoti—; *Canarese* : Hale—; *Chinese* : T'ung Hao—; *Deccan* : Gulchini—; *Egypt* : Mandiliye, Oehawan—; *Gujerati* : Guldaudi—; *Hindi* : Akurkurra, Gulchini, Guldaudi—; *Ladak* : Kalzang—; *Malta* : Crown Daisy, Bambagella, Fior d'oro, Lellux, Zigland—; *Marathi* : Gulesevati, Tursiphal—; *Persian* : Guledaudi—; *Punjab* : Bagaur, Zaenil—; *Sinhalese* : Lavulugas—; *Tamil* : Shamantippu—; *Telugu* : Chamanti—; *Urdu* : Gulechini—.

2. ***Chrysanthemum indicum*** Linn. is a native of China and Japan, grown in Indian gardens.

The natives of the Deccan administer the plant in conjunction with black pepper in gonorrhoea.

In China the flower heads are made into tonic and sedative preparations. Infusions are frequently applied as a collyrium in eye affections.

In Malaya the flowers are used for sore eyes and to promote longevity.

In Indo-China the leaves are used as a depurant; they are prescribed in migraine. The flowers are given for sore eyes and for inflammations of the abdomen.

The flowers in the form of an infusion are used by the natives of Guam as a remedy for intermittent fevers, and are valued by women as a remedy for hysteria and monthly irregularities.

Bengal : Chandramallika—; *Bombay* : Akurkura, Chevati—; *Chinese* : Yeh chu—; *English* : False Camomile, Indian Chrysanthemum—; *French* : Pyréthre—; *Guam* : Manzanilla—; *Hindi* : Guldaudi—; *Indo-China* : Cuc rieng vang, Gia cuc, Kien cuc am dat, Kim cuc—; *Ladak* : Kalzang—; *Marathi* : Shevati—; *Philippines* : Manzanilla, Rosa de Japón—; *Punjab* : Bagaur, Gendi—; *Tagalog* : Dolontas—; *Tamil* : Akkarakkaram—; *Telugu* : Chamunti—; *Urdu* : Gule-dawoodi—.

CICHORIUM.

This genus includes 8 species scattered over the temperate regions of the Old World; some occur in America as an introduction.

A. Annual	...	...	...	...	...	3. <i>C. Noënum</i> .
B. Perennial						
1. Stem leaves hastate at the base			...	...	...	1. <i>C. Endivia</i> .
2. Stem leaves entire		...	...	...	...	2. <i>C. Intybus</i> .

1. ***Cichorium Endivia*** Linn. is a native of the Mediterranean region, cultivated in India.

It is much valued by the Hakims as a resolvent and cooling medicine, and is prescribed in bilious complaints.

The root is used in dyspepsia and fever as a tonic and demulcent; the fruit as a cooling remedy for fever, headache, and jaundice.

The root is considered warm, stimulating, and febrifuge; given in 'Munjus', the diluent taken preparatory to purging; the seed is used in sherbets.

The root is officinal in Portugal.

Bengal: Kassin—; *Bombay*: Kasini—; *Dutch*: Andijire—; *Egypt*: Aburrukeyb, Endiwiya, Hendeba, Hindib, Shikuriya, Silis—; *English*: Garden Endive—; *French*: Chicorée blanche, Chicorée endive, Chicorée frisée, Endive, Escarole, Scariole, Scarole—; *German*: Endivie—; *Greek*: Radiki, Radikion—; *Hindi*: Kasini—; *Hova*: Saladingita—; *Iraq*: Hindiba—; *Italian*: Endivea, Indivia—; *Languedoc*: Enderio, Endevio, Endive—; *Mundari*: Risasalad—; *Portuguese*: Chicoreia, Endivia, Escarolla—; *Roumanian*: Laptuca—; *Russian*: Laktuk—; *Spanish*: Ekarola—; *Tamil*: Kashini—; *Telugu*: Koshi—; *Turkish*: Hiddiba—.

2. *Cichorium Intybus* Linn. is indigenous to Persia, and is cultivated in Europe and India. It is a common weed over all well-cultivated land in the vicinity of water-courses and wherever there is damp clay soil in Baluchistan, Waziristan, and North-West India up to 6,000 ft.

The Mahomedan writers recognize a cultivated sweet variety and a wild bitter variety.

In Loralai the plant is used as a cure for diarrhoea and bilious attacks.

In Persia, Baluchistan, and India the root is a resolvent and cooling medicine for bilious attacks. The seeds are also considered a cooling medicine.

In Europe the root is a bitter tonic, diuretic, and laxative. A decoction of 1 ounce of the root to 1 pint of boiling water is taken freely in jaundice, liver enlargements, gout, and rheumatic complaints. In France the leaf is considered as a very good substitute for the root; it is used in the form of an infusion, and as such is a very popular laxative.

The seeds are considered carminative and cordial. A decoction is used in obstructed menstruation and for checking bilious vomiting.

The root is officinal in Portugal; the root and the leaves are given official recognition in France.

Arabic: Hindubar, Indyba—; *Baluchistan*: Zral—; *California*: Chicory, Ragged Sailor, Saccory, Wild Bachelor's Buttons—; *Catalan*: Camaroya, Mastagueres, Xicoina, Xicoines, Xicoira, Xicoria amarga—; *Dutch*: Bitterste Chicory, Cichory, Wilde Cichory—; *Egypt*: Hendebe, Shikurie—; *English*: Chicory, Succory, Wild Endive, Wild Succory—; *French*: Barbe de capucin, Bois de corde, Cheveux de paysan, Chicorée amère, Chicorée sauvage, Ecoubette, Herbe à café, Herbe amère, Inthybe—; *German*: Blausamenwirbel, Cichorie, Hindig, Verfluchte Jungfer, Weglunge, Wegwarte, Wegweiss, Wilde Endive, Zichorie—; *Greek*: Kichora, Kikori, Kikorion, Korla, Seris Pikris—; *Gujerati*: Kasani—; *Hamadan*: Kashni—; *Hindi*: Hinduba, Kasni—; *Italian*: Cicorea, Cicoria, Radicchio—; *Loralai*: Kashin—; *Malta*: Chicory, Cicoria, Radicchio, Cicueira—; *Pacific Coast*: Blue Daisy, Blue Dandelion, Blue Sailors, Chicory, Succory—; *Persian*: Hinduba, Kasani, Kasni—; *Polish*: Podroznik—; *Portuguese*: Almeirao, Chicorea brava—; *Provence*: Cicoureio—; *Punjab*: Gul Hand, Kasni, Suchal—; *Roumanian*: Cicoare—; *Russian*: Tsikorie—; *Spanish*:

Achicoria, Achicoria silvestre, Achicoria amarga, Chicoria—; *Swedish*: Waegwarda—; *Tamil*: Kashini—; *Teheran*: Kashni—; *Telugu*: Kasini—; *Urdu*: Kasani—; *Uruguay*: Achicoria—; *Yemen*: Hendibe—.

3. **Cichorium Noeatum** Boiss. is found in Baluchistan whence it spreads over to Mesopotamia.

In Baluchistan the flowers are soaked in water, and the water used for sore legs and also for the stomach derangement called 'dik'.

Brahui: Kashnen, Kashni, Talka kah—.

CNICUS.

The genus numbers about 150 species found in the northern temperate regions.

C. japonicus Maxim., *C. sinensis* Gard. and Champ., *C. spicatus* Maxim. are used medicinally in China and Japan; *C. arvensis* Hoffm., *C. benedictus* Linn. in Europe; *C. arvensis* Hoffm. in the Pacific Coast States of North America.

Heads dioecious	...	...	...	... 1. <i>C. arvensis</i> .
Heads bisexual	...	...	...	... 2. <i>C. sinensis</i> .

1. **Cnicus arvensis** Hoffm. is found in Bengal and the Gangetic Plains extending from the Sunderbunds to the Punjab. It occurs in the Western Himalaya from Kashmir to Kumaon, and in Western Tibet at 11,000-13,000 ft. It is distributed to Northern Asia and westwards to the Atlantic.

The plant is emetic, tonic, diaphoretic, and reported to contain an alkaloid.

The root is astringent.

England: Creeping Field Thistle—; *Pacific Coast*: Canada Thistle—.

2. **Cnicus sinensis** Gard. and Champ. is a native of China extending to Burma and India. It occurs in marshy places on the Khasia Hills at 4,000-6,000 ft.

The stem and leaves are antiscorbutic. The root is given internally for flatulence; externally it is used for ulcers and abscesses.

Chinese: K'u Ao—.

COTULA.

The genus includes 50 cosmopolitan species found mostly in the southern hemisphere.

C. aurea Loefl. and *C. coronopifolia* Linn. are used medicinally in Europe; *C. anthemoides* Linn. and *C. villosa* DC. in South Africa.

Achenes ovate with thick narrow wings. Leaves bipinnatifid or bipinnatisect	...	...	...	... 1. <i>C. anthemoides</i> .
Achenes oblong hardly winged. Leaves 1-2-pinnatifid	...	...	...	... 2. <i>C. aurea</i> .

1. **Cotula anthemoides** Linn. is found in the Gangetic Plain from Rajmahal and Sikkim westwards to the Punjab. It is distributed to China and to Africa, Northern and Southern.

The plant heated with oil is applied externally in rheumatism. The infusion is used as a wash in most diseases of the eye.

A decoction is a Xosa remedy for head and chest colds. The nostrils are sometimes filled with the crushed leaf for colds.

The Sutos use a decoction of the leaf and root as a colic remedy.

Egypt: Ribbin—; *Hindi*: Babuna—; *Kashmir*: Tulobe—; *Punjab*: Babuna—; *Suto*: Hlapi-e-nyenyane—; *Urdu*: Babunah—; *Xosa*: umHlonyan—.

2. **Cotula aurea** Linn. is found in the Punjab. It is spread over Persia, Syria, Malta, Algeria and Spain.

In Spain the plant, chiefly the flowers, is used as a tonic, diaphoretic, anthelmintic, antipyretic, antihysteric, and for pain in the bowels. The flower heads are officinally recognized.

Catalan: Camamilla fina—; *Spanish*: Manzanilla fina—.

CREPIS.

The genus includes 170 species, natives mostly of Europe, Asia and North Africa.

Crepis acaulis Hook. fil. is common in the subtropical Himalaya from Jammu to Bhutan, in the Lower Gangetic Plain, Central India, Kanara and the Nilghiris. It is equally common in Burma.

Among the Mundas of Chota Nagpur the baked leaves, or the root ground and mixed with goat's milk, are taken to activate the secretion of milk in women. The root is also eaten raw in urinary complaints.

Mundari: Etete-ara, Pirieteke—.

DICHROCEPHALA.

The genus consists of 5 Asiatic and African species.

Dicrocephala latifolia DC. occurs on the Western Ghats from Bombay southwards, in the tropical and subtropical Himalaya from Simla to Sikkim at 8,000-9,000 ft., in the Khasia Hills, Cachar, Burma, and in the Malay Peninsula where it is rare. It is distributed over tropical and subtropical Asia and Africa.

The young shoots are used externally in Cambodia for the treatment of blennorrhagia in women, and for the bites and stings of insects.

Cambodia: Kbet choun thom, Kombet choun—; *Indo-China*: Phuc linh thai—.

DICOMA.

The genus numbers 30 species inhabiting Africa, Madagascar, and tropical Asia.

D. tomentosa Cass. is used medicinally in West Africa; *D. anomala* Sond., *D. capensis* Less., *D. speciosa* DC., *D. Zeyheri* Sond. are used in South Africa.

Dicoma tomentosa Cass. is spread over India from the North-West and the Punjab to Sind, Gujarat, the Deccan, the South Mahrata Country, the Carnatic, Mysore, Coimbatore, and the Nilghiris. It is fairly common in tropical Africa.

The herb is strongly bitter, and is used in the neighbourhood of Belgaum as a febrifuge, especially in the febrile attacks to which women are subject after childbirth.

In Hausa and Nigeria the herb is used as a local application to putrescent wounds.

Belgaum: Navananjichapala—; *Gujerati*: Gholaharnacharo—; *Hausa*: Dau da, Farin dayi, Kwardauda, Surandu—; *Katagum*: Dowda—; *Rajputana*: Vajradanti—.

DORONICUM.

The genus consists of 25 species, inhabitants of the northern temperate regions of the Old World.

D. austriacum Jacq., *D. Columnae* Tenore, *D. Pardalianches* Linn., *D. plantagineum* Linn. have been used medicinally in Europe.

- A. Achenes all pappose. Heads 1-2 2. *D. Hookeri*.
- B. Achenes of the ray epappose, of the disk pappose.
 - 1. Herbaceous, 2-4 ft. high. Heads few or numerous ... 3. *D. Roylei*.
 - 2. Stout herb, 1-1 $\frac{1}{2}$ ft. high. Heads 1-2 1. *D. Falconeri*.

1. **Doronicum Falconeri** Clarke occurs in Kashmir at an altitude of 13,000 ft., and in the Karakoram Range at 14,000 ft.

The root is said to be useful in nervous depression.

2. **Doronicum Hookeri** Hook. fil. is found in the Sikkim Himalaya at Lachen and Tungu between 12,000 and 14,000 ft.
The root is an aromatic tonic.

3. **Doronicum Roylei** DC. is found in Kashmir and Garhwal at 10,000 ft.

The root is used to prevent giddiness on ascending heights.

ECHINOPS.

The genus includes 82 species, mostly Mediterranean distributed over Southern and Eastern Europe, tropical and North Africa, and Asia to Japan and Siberia.

E. dahuricus Fisch. is used medicinally in China; *E. longifolius* L. Rich. in Nigeria.

Turkish Manna is obtained from *E. persicus* Stev.

Three alkaloids—echinopseine, echinopsine, and B-echinopsine—have been isolated from the seeds of *E. ritro* Linn.

Echinops echinatus Roxb. occurs more or less throughout India and Afghanistan.

The plant is used by both Ayurvedists and Yunanists.

At Hesargai the roots are pounded and mixed with Acacia gum and applied to the hair to destroy lice; also the powdered roots are applied to wounds in cattle to destroy maggots.

Arabic: Ashtarkhar—; *Gujerati*: Shulhiyo, Utkanto, Utkato—; *Hindi*: Gokhru, Utakanta, Utakatira—; *Marathi*: Kadechubak, Utanti, Utati, Utakatra—; *Ormara*: Gurgaj—; *Persian*: Astarkhar—; *Pushtu*: Chingamwali—; *Sanskrit*: Kantalu, Kantaphala, Karamadana, Mukhadanttarujapaha, Rakta-pushpa, Shrigala, Shunakashana, Tikshnagra, Ushtarakanta, Utati, Utkantaka, Utkatotkata, Vritttaguchha—; *Urdu*: Untkatara—; *Yemen*: Jirdama—.

ECLIPTA.

The genus consists of 4 species, South American, Australian, and cosmopolitan.

Eclipta alba Hassk. is cosmopolitan in warm climates. It is found throughout India, ascending to 6,000 ft. in the Himalaya and other mountains.

The plant is an Ayurveda and Yunani medicine.

It is principally used as a tonic and deobstruent in hepatic and splenic enlargements, and in various chronic skin diseases. There is a popular opinion that the herb taken internally and applied externally will turn the hair black.

The fresh plant is applied with sesamum oil in elephantiasis, and the expressed juice is taken internally in affections of the liver and dropsy. When used in large doses, it acts as an emetic. It is also considered cooling. It is anodyne and absorbent, and relieves headache when applied with a little oil.

The plant is considered an astringent in China, and is used for checking haemorrhages and fluxes and strengthening the gums. The plant is rubbed on the gums for toothache, acting as a counter-irritant.

The plant is much used as a cure for asthma and bronchitis in Indo-China. In Ceylon it is used to purify the blood.

In La Reunion the plant is considered as pectoral and anti-asthmatic. The decoction is prescribed externally for skin diseases and elephantiasis.

In Bombay, the natives use the juice in combination with aromatics, as a tonic and deobstruent, and give two drops of it with eight drops of honey to new-born children, suffering from catarrh. In the Gujerat district of the Punjab, it is used externally for ulcers, and an antiseptic for wounds in cattle.

The root is given to relieve the scalding of urine. In Chota Nagpur it is applied in conjunctivitis and galled necks in cattle.

In Assam the leaves are reputed to cure sores when applied to them.

The juice of the leaves is generally given in one teaspoonful doses in jaundice and fevers. It is rubbed fresh on the shaven scalp for the purpose of promoting the growth of the hair. The pounded leaves are prescribed in haemorrhage.

In Gold Coast the leaves are ground and mixed with cold water; this mixture is then drunk to cure constipation.

The leaves are used in Brazil as a remedy for diarrhoea and as a black stain for the hair.

In scorpion sting the leaves are rubbed on the part affected as well as inhaled. In practice the leaves are first rubbed from above the inflamed part down to the sting; they are then made into a paste and applied as a poultice.

Koman, summing up his work with this plant, says: 'There are two varieties of the plant—the yellow flowered and the white flowered—the former variety has thicker leaves which are extensively used in catarrhal jaundice. The fresh leaves are well washed, ground with a few pepper corns, and a lump of the size of a lime is administered early in the morning in sour curd or buttermilk. I have found this drug very useful in curing the disease when so administered for five or six days. Occasionally a purgative may be required to aid the action of the drug. In its action, it resembles podophyllin and taraxacum. It may be administered in the form of a succus.'

Arabic : Kadim-el-bint, Tolak—; *Ashanti* : Ntum—; *Baluchi* : Murida—; *Bengal* : Kesari, Keshori, Kesuti, Keysuria—; *Brahui* : Bikgur—; *Canarese* : Garagadasappu, Kadiggaraga—; *Ceylon* : Kailachi, Kavichi illai, Karichalan-kanni, Karippan—; *Chinese* : Han Lien Ts'ao, Li Ch'ang, Me Teou T'sao, Pa Ko Ts'ao—; *Egypt* : Sa'de—; *Gujerati* : Bhangra, Dodhak, Kalobhangro, Kaluganthi—; *Hasada* : Pirikesari—; *Hindi* : Babri, Bengraya, Bhangra, Mochkand, Mochrand—; *Ilocano* : Tintatinta—; *Indo-China* : Co muc, Lien tao, Nho noi, Phong trang, Phong truong—; *Iraq* : 'Arundis—; *Kolami* : Hatukesari—; *Lagos* : Abikolo—; *Mundari* : Benggaraj, Benggraj, Bhenggaraj, Bhenggraj, Huringgarsiranu, Sarsingranu—; *Rajputana* : Jal bangra—; *Sadani* : Bengaria—; *Sanskrit* : Ajagara, Angaraka, Bhekaraja, Bhringa, Bhringaraja, Bhringasodara, Bhringavha, Ekaraja, Karanjaka, Kesharaja, Kesharanjana, Keshya, Kuntalavardhana, Mahabhringa, Mahanila, Markara, Markava, Nagamara, Nilabhringa- raja, Nilapushpa, Pankajata, Pararu, Patanga, Pitripriya, Rangaka, Shyamala, Sunilaka—; *Santal* : Lalkesari—; *Sind* : Tik—; *Sinhalese* : Kikirindi, Kikirindi-ha—; *Tagalog* : Higuismanoc—; *Tamil* : Kaikeshi, Kaivishilai, Karisha- langanni—; *Telugu* : Galagara, Guntagalijeru, Guntakalaagara—; *Urdu* : Bhangra—; *Uruguay* : Yerba de la oveja—; *Yoruba* : Abikolo, Arojoku—

(To be continued).

NOTES ON BUTTERFLIES OF THE SHAN STATES.

BY

CAPT. W. C. CARROTT.

(Continued from page 665 of vol. xl).

Since writing the list of butterflies found in the Shan States I would like to mention one or two observations made and not mentioned in the first list.

During April of this year I caught a damaged specimen of *Chilasa slateri marginata*. So this butterfly does appear in the Shan States. I caught the above specimen at Maymyo, 3,500 ft.

Byasa aidoneus. A couple of males of this butterfly was caught by me during May of this year, so evidently it is double brooded.

In my previous list I mentioned that *Papilio noblei* was reported to be plentiful in the Myitkyina District. I have visited this district twice this year, end of March and end of June. During my first visit I caught one male, and the second visit I was fortunate in getting half a dozen. It flies along with *helenus helenus* and *chaon chaon* and is difficult to differentiate when on the wing. Like others of this family it settles on the damp patches of ground. No females were caught or seen.

One other butterfly caught in March in this district and not recorded as being found in Burma was *Elymnias pealii*. Evans mentions it as being found in Assam.

While on this tour end of March I came across *Appias nero galba* gathered on the sand near a stream and I never saw so many butterflies together before. Truly there were hundreds of thousands, chiefly wet season form and only a few of the dry season form. Why the wet season form should be out and in the majority instead of the dry season form I am at a loss to understand. It was impossible to collect one at a time as each sweep of the net caught at least fifty. All males of course.

Another interesting capture while on this tour was a *Penthema* which differs from *lisarda lisarda* or *darlisa*. It favours *darlisa* but does not have sub-marginal spots shaped like arrow heads. The colour of the spots are not so blue and some other markings are different. It would appear to be an intermediate race. I caught two males of this butterfly.

NYMPHALIDÆ.

CHARAXES

polyxena hiera. Fd. Fairly common all over the Shan States. Males are filth eaters and are to be found feeding on excreta of wild animals. The varieties *corax*, *hipponax* and *pleistoanax* are also found along with *hierax*.

marmax. Wd. I have seen this only in the South Shan States and is very rare there.

fabiush sulphureus. Roth. Not seen in the North but fairly plentiful at Lebin, 2,000 ft. in the South.

ERIBOEAE

schreiberi assamensis. Roth. Caught two males of this very rare butterfly at Maymyo, 3,500 ft. One on October last year and the other about ten years ago.

athamas athamas. Dr. Very common all over the country.

arja. Fd. Also very common.

moori sandakanus. Fruh. Very rare indeed. Not seen in the Shan States, but a damaged specimen was given me and caught near Pyinmana probably at the foot of the Shan States Hills.

dolos magniplaga Fruh. Found at Kalaw in the South. None seen in the North. A friend of mine at Kalaw found three chrysalises in his garden and was successful in breeding two of them, a male and a female.

dolos grandis. Roth. Males fairly plentiful at Kalaw in the South. I used to catch quite a number while feeding on the bed of a stream near the Railway Station.

narcœa lissainei. Tyt. Very rare indeed. I have seen only one and failed to net it.

eudamippus nigrobasalis. Lathy. A few caught in different parts of the States.

delphis. Db. Not seen in the Shan States proper, but they are fairly plentiful on the Karen Hills in the Toungoo District.

PROTHOE

calydonia bellisama. Crow. Not seen in the Shan States proper, but a couple of females were caught by me at Pathechaung at the foot of the Karen Hills, end of April of this year.

franckii angelica. But. Not seen in the Shan States. A pair caught at Pathechaung same time as above.

APATURA

cooperi. Tyt. I have caught half a dozen pairs at Maymyo which I believe is the only place in which it is to be found.

ulupi kalaureica. Tyt. This should be spelt *kalawiea* as it was first found by my friend Mr. Dingavan at Kalaw and from whom General Tytler got his specimens. I have not seen it in the North and it appears to be very rare even in the South.

dingavani. This new butterfly has not yet been officially recorded, but I understand Mr. Dingavan of Kalaw has sent specimens to General Evans for naming. It is somewhat like *ulupi florenciae*. Strange to say this new butterfly is only found in the garden of Mr. Dingavan at Kalaw. The country round about has been searched but no trace of it can be found. About six pairs have so far been caught, one pair of which is in my collection.

ambica ambica. Koll. Not at all common in the Shan States. I have seen only one at Maymyo and one other at Kalaw. It is more common on the plains in the North of Burma.

parisatis parisatis. Wd. I caught a number of males at Yinmabin 1,200 ft. in the Southern Shan States. I have not seen any females. It does not appear to fly at higher altitudes.

HERONA

marathus marathus. Db. Fairly plentiful at Maymyo in the North, but not seen elsewhere.

SEPHISA

chandra. M. Males very common in the Shan States. One female of the typical form caught by me at Maymyo, and one female of the variety *chandranā* in my garden. I have not seen the variety *albina*.

EURIPUS

halitherses. Dob. and Hew. Two males in my collection. No females seen

DIAGORA

persimilis persimilis. Wd. Rare in the Shan States. One male caught at Maymyo this year, and one male at Kalaw.

HESTINA

nama. Db. Fairly common in the South but rare in the North.

CALINAGA

buddha sudassana. Melvill. I generally manage to collect two or three males every year, end of March or beginning of April. This year I was more fortunate and caught two females in coitus.

PENTHEMA

darlisa. M. Caught a few males in the Momeik State, just above Mogok Ruby Mines. This year I caught two males of the variety mentioned at the beginning of this list.

DICHLORAGIA

A few caught in both North and South.

STIBOCHEIONA

Rare and only one seen which I could not net.

EUTHALIA

cocytus satrapaces. Hew. Caught a number of these at the foot of the Karen Hills, but not seen in the Shan States proper.

lepeidea sthavara. Fruh. Common at Maymyo in the North.

julii sedeva. M. Plentiful all over the Shan States.

jahnu jahnu. M. Fairly plentiful.

anosia anosia. M. Rare. I have caught about six in the course of 15 years.

telchinia. Men. Very rare. Only seen one and that many years ago.

mahadeva binghami. De N. Caught one male this year at the foot of the Karen Hills, end of April. I have not seen it in the Shan States proper.

merta eriphyle. De N. Only one caught by me.

garuda garuda. M. Common all over the country.

jama verena. Fruh. Rare. Only one male caught at Maymyo.

phemius. Db. Rare in the Shan States. A pair caught by me at Maymyo during 1938.

lubentina. indica Fruh. Not too plentiful. I caught a few in the North Hseniwl State a few years ago. An occasional one at Maymyo in April.

nara shania. Ev. This used to be plentiful at Kalaw, but it is now scarce and very seldom seen.

sahadeva narayana. GrS. and Kir. Not rare, and I manage to collect a few good specimens every year at Maymyo.

pratti cooperi. Tyt. Very rare, and I have only managed to net one during my many years residence in Maymyo.

patala taoana. M. Fairly rare, but odd ones can be caught both at Maymyo and Kalaw.

evelina eve'ina. Stoll. Rare. Only two in my collection; both caught at Maymyo.

ADOLIAS

cyanipardus. But. Rare. One male in my collection caught at Kalaw.

dirtea jadeitina. Fruh. Fairly common at altitudes of about 2,000 ft.

PARTHENOS

sylvia gambrisius. F. Common all over the Shan States.

LEBADEA

martha attenuata. Very common at lower altitudes.

NEUROSIGMA

doubledayi nonius. De N. I have caught a few in Maymyo as well as Kalaw. I notice Evans records this as from Karen and Dawnas. However the Karen should be placed geographically in the Shan States, especially from an entomological point of view.

LIMENITIS

daraxa. Dob. and Hew. I have caught a few males at Maymyo, but to date have not been able to secure a female. It occurs also in the South.

dudu. Wd. Very rare, and I have only been able to collect a pair during my many years of collecting.

procrys procrys. Cr. Very common all over the Shan States.

PANTOPORIA

sulpitia adamsoni. M. I have caught a few of these at Maymyo.

nefte inara. Db. Not too plentiful. Two or three specimens caught every year.

cama. M. Same remarks as the above.

selephora selephora. Koll. Very common indeed, especially males which delight in gathering on moisture on the roads.

zeroa. M. Rather rare in the Shan States.

opalina orientalis. Eb. A few of these can be caught during the rains at Maymyo.

ranga ranga. M. Not too rare. I have caught a number of good specimens during my residence in the Shan States.

larymna siamensis. Fruh. Rare, but I have succeeded in collecting a few good specimens at Maymyo.

asura asura. M. Not at all rare.

perius. L. Very common.

NEPTIS

columella ophiana. M. Common.

jumbah jumbah. M. Common.

magadha khasiana. M. Very rare. Only one male caught by me.

hylas astola. M. Very common.

hylas adara. M. Very common.

soma soma. M. Rare, only one male in my collection.

nandina susruta. M. Not too plentiful.

yerburyi shania. Ev. Fairly plentiful at Maymyo.

sankara quilita. Sw. Rare and very seldom seen.

harita. M. Also rare, only one male caught by me.

anjana nashona. Sw. Rare.

ananta ochracea. Ev. Rare, found at Kalaw in the South.

manasa. M. Not very rare, but very local. I have secured a number from Kalaw; and if one knows their feeding plant it is not difficult to get a number.

dindinga assamica. M. Very rare. A couple of males only in my collection

hordonia hordonia. Stoll. Common all over the Shan States.

CYRESTIS

periander periander. F. I have only seen this very fragile butterfly at the bottom of the Goteik Gorge in the North.

cocles cocles. F. As above.

thyodamas thyodamas. Bdv. Very common.

CHERSONESIA

risa. Dob. and Hew. Fairly plentiful in all of Shan States.

rahria rahrioides. M. Not so plentiful as the above, but quite a number can be collected in one season.

PSEUDERGOLIS

wedha. Koll. Very common at low altitudes but rare at higher elevations

HYPOLIMNAS

misippus. L. Very rare in the Shan States. Common in the plains.

bolina. L. Fairly common all over the States.

YOMA

sabina vasuki. Doh. Males are very common around Maymyo as they can be found in swarms feeding on cement bridges.

RHINOPALPA

polynice birmana. Fruh. I have not come across this in the hills, but secured a couple of males at the foot of the Karen Hills, Toungoo District.

DOLESCHALLIA

bisal tide indica. M. Only found at low altitudes. One male only in my collection.

KALLIMA

inachus limborgi. M. Fairly common all over the Shan States.

PRECIS

hierta magna. Ev. Very common.

ortihya ocyale. Hub. Common.

lemonias lemonias. L. Very common.

almana almana. L. Very common.

atlites. L. Common.

iphita iphita. Cr. Extremely common.

VANESSA

cardui. L. Rare in the North. Odd ones can be picked up at Kalaw in the South.

indica indica. Herbst. Also rare in the North; but fairly plentiful in the South, Kalaw to Taungyi.

canace canace. L. Common all over the Shan States.

SYMBRENTHIA

hippoclus khasiana. M. Common.

hypselis cotanda. Rare in the Shan States. I have only collected three of these in and around Maymyo. Odd ones have been found at the foot of the hills in the South.

ARGYNNIS

hyperbius hyperbius. L. Very common at altitudes of 3,000 ft. and over. They feed and breed on violets in my garden at Maymyo.

childreni childreni. Gray. Rare. Only found this at Kalaw. Not seen in the North.

CUPHA

erymanthis lotis, Sulz. One of the commonest butterflies in Maymyo.

ATELLA

phalanta. Drury. Very common indeed.

atcippe burmana. Ev. Very rare at high altitudes. Very seldom seen at above 1,000 ft.

ISSORIA

sinha sinha. Koll. Very common all over the country.

CYNTHIA

crota erota. F. Common at low altitudes. Fairly scarce in the hills.

CIRROCHROA

fasciata. Fd. I have only seen this at the foot of the Karen Hills near Taungoo.

neris olivacea. De N. Rare in the hills but fairly plentiful at low elevations.

tyche mithila. M. Also rare in the hills but common on the plains.

CETHOSIA

biblis tisamena. Fruh. Fairly common.

cyane. Drury. Not common.

ERGOLIS

ariadne pallidior. Fruh. Common all over the Shan States.

merione assama. Ev. Also very plentiful.

LARINGA

horsfieldii glaucescens. De N. I used to consider this very rare, and purchased a pair for my collection. The following year I secured half a dozen pairs at Maymyo. It is fairly common at Nanpandet at the foot of the South Shan State Hills.

PAREBA

vesta sordice. Fruh. Common both at Maymyo and Kalaw. Can be collected by the dozen feeding on young paddy plants.

ERYCINIDÆ.**LIBYTHEA**

lepta lepta. M. Fairly common.

myrrha sanguinalis. Fruh. Common.

marina rohini. Mar. Very rare.

ZEMEROS

flegyas indicus. Fruh. Very common indeed.

DODONA

eugenae venox. Fruh. Very rare in the Shan States.

egeon. Db. Rare, but odd specimens can be found every year.

ouida ouida. M. Same as above.

henrici longicaudata. De N. Very rare. Only one male in my collection

henrici deodata. Hew. A few specimens collected by me at Maymyo.

ABISARA

fylla. Db. Very common.

neophron neophron. Hewt. Fairly plentiful all over.

chela kalawna. Ev. Very rare.

echerius angulata. M. Very common.

kausambi paionea. Fruh. Fairly rare.

TAXILA

thuisto sawaja. Fruh. I have only found this at the foot of the Karen Hills.

haquinus fasciata. M. Found both in the North and South.

(To be continued).

MISCELLANEOUS NOTES

I.—BEHAVIOUR OF MONKEYS WHEN ATTACKED.

The extraordinary habit of monkeys leaving trees when attacked by dogs referred to by Mr. Dunbar Brander on p. 165 of vol. xli is common also in the case of the Nilgiri Black Langur on these hills, and a good account of this curious trait will be found on p. 185 of *Game* by 'Hawkeye' published in 1876; no explanation is however offered for such peculiar behaviour.

That wild dogs profit by this failing is evident from the fact that I have on more than one occasion in the Kundahs found black monkey fur in wild dog droppings.

E. G. PHYTHIAN-ADAMS,

KALHATTI,

Major.

NILGIRIS.

September 10, 1939.

II.—EFFECTS OF MAULING BY TIGER.

Just after reading Mr. H. A. Fooks' interesting note on the above subject in the August number of our *Journal* I was reading Dr. Haliday Sutherland's latest book—*Hebridean Journey* in which he tells the following story about a man he met at an inn at Pollachar in the Outer Hebrides (p. 164).

'Outside the inn I met a man who had lost an arm by being mauled by a tiger when shooting in Ind'a. Having written an excellent book about tigers, he was trout fishing at Pollachar before returning to India in order to make a film about tigers. I asked him if he had felt pain when the tiger was mauling his arm.'

'Not the slightest pain,' said he.

'That's very interesting, because Livingstone had the same experience when being mauled by a lion.'

'The only pain I felt was when my friend in trying to shoot the tiger missed, and like a damn fool put the bullet through my foot. That stung a bit.'

The above exactly bears out Mr. Fooks' experience.

LISMORE,

W. H. WORKMAN.

WINDSOR,

BELFAST.

III.—A BATTLE ROYAL BETWEEN TIGERS AND AN ELEPHANT.

While Hitler and Stalin were carrying out a cruel and ruthless attack on Poland, two other tigers carried out an equally cruel and ruthless attack in another part of the world. The account below of a jungle battle to the death was given to me by entirely reliable eye- and ear-witnesses, and in its main details is very well authenticated.

The Sarda river, one of the major rivers of the Himalayas, where it debouches from the hills, spreads out into a mile-wide bed of boulders and sand, dotted with islands of *shisham* trees and coarse grasses. On the right high bank, sixty or seventy feet above the river, is the small townlet of Tanakpur, with a railway terminus, a bazaar, and several bungalows situated on the bluff, looking across the wide river bed to the wild forest clad foot-hills of Nepal. In the cold weather Tanakpur is alive and populated with hill people. Forest contractors are busy exporting timber from the extensive forests, and there is a stream of cross traffic to and from Nepal. In the rains, it is almost deserted. Malaria then drives away the hill people, and the flooded river cuts off all communication with Nepal.

Late one evening in the last week of September, three men were fishing with nets in the waters of the Sarda, two or three furlongs from the bungalows on the bluff, when suddenly two tigers and a half-grown cub emerged from one of the grassy islands close by. The men shouted and yelled and the tigers moved off across the dry bare bed of the river towards the forest on the right bank, a quarter of a mile away up stream from the bluff. Simultaneously from this forest the men heard the trumpeting of a wild elephant. Shortly afterwards the fishermen, and the few dozen inhabitants of the bazaar, heard the nerve-shattering roar of a charging tiger, and the fishermen saw a big male tusker elephant come out into the open river bed, being attacked by the two tigers. For three hours the battle between the elephant and the tigers raged up and down the river bed, below the high bluff, in full view, in the moonlight, of the bungalows on the cliff. Would I had been there to see and hear ! The bazaar inhabitants were so terrified at the appalling noise and infuriated roars of the tigers so close at hand, that they barricaded themselves in their houses and no one, except the petrified fishermen who were cut off, saw this awe-inspiring and unique spectacle. About 11 p.m. the noise died down, and next morning the tigers had departed, but the dead elephant was lying at the foot of the bluff, within a stone's throw of a bungalow.

The marks on the unfortunate elephant were very instructive. The trunk was quite untouched and so was the face except deep scratches around the eyes, and *both eyes had been clawed out*. There were terrible bites and scratches on the top of the head and neck, back and rump, and finally the throat had been bitten and torn open—evidently the *coup de grâce*.

These are the facts as told to me by the eye-witnesses and by the *tahsil* officer who heard the battle and who had the job of getting rid of the body of the elephant. From them we can deduce the probable—or at least possible—course of events.

It is inconceivable that the tigers made a senseless and unprovoked attack on a full-grown tusker elephant, and equally inconceivable that the elephant started the fight. (He was neither 'musth' nor a rogue). It is probable that the tiger cub was the cause of the trouble. He may have blundered into the elephant or gone sniffing around in curiosity and received a kick or a blow for his trouble, causing him to yelp. This would at once raise the maternal fury of the tigress, and the tiger would come to the help of his mate.

The wounds on the elephant give an indication of the tactics of the tigers. It is clear that no frontal attack was attempted, or the trunk and face of the elephant must have been mauled. Probably one tiger threatened or demonstrated in front, enabling the other tiger to leap on the back (an easy leap for a tiger) and start biting and scratching. It was probably shaken off several times, but again returned to the attack. At some stage of the fight, one of the tigers must have managed to jump or crawl on to the top of the head and from that position to have clawed out the eyes, perhaps deliberately, for it seems a natural instinct of the cat tribe to go for the eyes. One can imagine the poor blind elephant, tortured with the fiendish laceration of its back, stumbling along in agony over the boulders and rough ground, falling ultimately over some low bank and exposing its throat to a hellish mauling from the other tiger, and dying from loss of blood or severance of its wind-pipe. Truly the tigers took a terrible revenge for any possible injury to their cub.

No measurements of the elephant were taken. The tusks were small but old and worn, about 32 inches long excluding a foot or more embedded and 14 inches girth at the base, and the two tusks together weighed 122 lbs.

Although I have heard of elephant calves being occasionally killed by tiger, I have never before heard or read of a fight to a finish between tigers and a full-grown bull elephant. That it should have taken place before eye-witnesses, and within ear-shot of many more, is a piece of remarkable luck.

LUCKNOW,
December 22, 1939.

E. A. SMYTHIES,
C.I.E., I.F.S.

[Encounters between tigers and elephants occasionally occur. Mr. Q. G. Corbett writing in our *Journal* (Vol. vii, p. 119) gives three instances. Two deal with attacks on female elephants: the objective in one being a calf which was killed despite the mother's attempts at rescue. The third records an attack on a big tusker, which was so dreadfully mauled along the whole length of its back, that it died a few days after. As is usual with big animals which cannot be easily mastered, the tigers' attack in the three instances reported

by Corbett was not frontal, but directed from the rear : the tiger biting into the hind quarters, back and shoulders. The tigers' way with elephant calves is to hamstring them or attempt to do so. Mr. Milroy (*Jour., B.N.H.S.*, Vol. xxxii, p. 370) in two seasons shooting in North Cachar came upon 4 or 5 elephant calves that had been attacked in this way. In the instance reported in our *Journal* by Mr. J. K. Swaine (Vol. xxxvi, p. 983) the tiger's attack on a cow elephant was directed to the belly and under parts. This change from the usual method was probably an adaptation to circumstances. The tiger is a versatile killer and follows no stereotyped method in his killing. The cow elephant was lying down, and Mr. Swaine concludes that the tiger attacked her as she lay probably clinging on with teeth and claws tearing away the flesh by its weight as the elephant got up. She appeared in camp the next morning with a huge wound stretching from her right fore-leg to well under her belly, the torn flesh hanging almost to the ground.—EDS.]

IV.—A LARGE PANTHER.

I think it will interest you to know that recently on March 23, 1939 in one of my jungles in Central India I shot a panther which measured between pegs 8 feet 6 inches. The panther was measured within an hour of its being shot. The skin of the panther was cured by Messrs. Van Ingen & Van Ingen, Taxidermists of Mysore (India). The skin now measures 8 feet 10 $\frac{1}{2}$ inches. I may mention here that the skin was not unduly stretched in the process of its being cured.

YASHODHAR SINGH,
RAJ-KUNWAR.

PALACE,
KHILCHIPUR,
(Central India).
October, 1939.

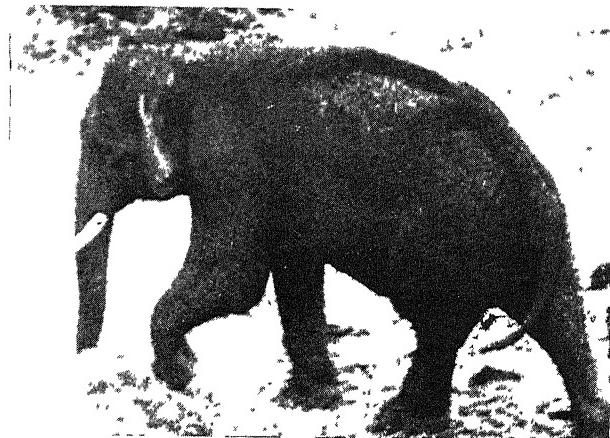
V.—BEHAVIOUR OF GAUR AND ELEPHANT.

(With a plate).

I have read with interest Mr. Mustill's note on the behaviour of gaur on page 731 of the May, 1939 issue.

I have had further experience since my contribution of September 1938. Using a Cine Kodak '8' and an old Kodak '3A' Camera (in use for the last 20 years) I have been able to take the accompanying photos of both bison and elephant at under 30 yards, and my previous experience as regards bison is fully borne out. As with Mr. Mustill's experience, I found no difficulty on two occasions in letting a whole herd of bison graze up to me.

Journ., Bombay Nat. Hist. Soc.



Photos by

Major H. J. Rossel.

Bison and Elephant taken within 30 yards distance.

My tracker on one occasion actually counted 40, and by the time I had succeeded in reversing the Ciné film behind a totally inadequate tree, the herd was grazing on each flank within 20 yards. They were not in the least suspicious until, having finished my film, I deliberately sent them off for fear of being run over by accident should they get my wind on moving behind me.

The photograph of the elephant shows a good tusker in his prime, which Major Phythian Adams and I succeeded after some effort, in working out of tree jungle into a fairly good light about 9 a.m. I managed to take 50 feet of cine film within 30 yards before the tusker made off into the river bed amidst dense 'lantana' growth, which was too thick (and the light too bad) for further efforts.

Both photos were taken at the northern foot of the Nilgiris. I was able to obtain a riding elephant for a few days to try for cine pictures of Chital, (the unburnt grass being 5 feet high) and the dislike of most animals, particularly pig, and to a somewhat lesser extent chital, to the near approach of an elephant was extremely noticeable—sambhur were much more tolerant.

There are many elephants in these forests, and the behaviour of other animals generally, appears an interesting commentary on the disposition of solitary elephants towards jungle life, apart from man.

It was noticeable that most animals did not dash away, as they would have on smelling or seeing man, but (for example chital) slipped quietly away in the long grass with tails down and no warning cries. This may be a suitable subject for discussion.

Practically all shooting in South India is done on foot.

H. J. ROSSEL,
Major.

25 WARWICK ROW,

MEERUT.

October 2, 1939.

VI.—ON THE DISTINCTION BETWEEN INDIAN AND MALAYAN GAUR.

(*With a plate*).

In the Honorary Secretary's report for the year 1938, Mammals, it is indicated that Lydekker differentiates between the Malayan Gaur and the Indian Gaur by the smaller development of the cranial ridge in the former as opposed to the marked development in the latter, and to some differences in colour and markings and the presence of a dewlap. Mr. Theodore Hubback disposes of this last suggestion. I therefore think it to be of general interest if you would publish the enclosed 4 photos which I venture to suggest completely dispose of the first theory. These four bulls were all shot within a radius of 10 miles in Datrang, Assam and

clearly show a marked difference in cranial development although the horns may be said to be of equal calibre.

Whilst on the subject of Bison, I should be greatly interested to hear if any further light has been shed on the vexed question of whether it has been established that there is a wild species of *Bos frontalis*. Any Assamese or Mikir Shikari will glibly talk of *Muh*, (buffaloe) Mithan and *Gurov*, (cow) Mithan, but although I have seen many mithan I have never succeeded in establishing any differences. I know many well-known and reliable Europeans who believe in the two wild species, but is there yet any scientific proof in the matter? I may say, in case it is suggested that my photos represent *Bos frontalis* and *Bos gaurus*, that all these animals were large black, almost hairless bulls none of which on account of size alone could be described as *Gurov* (cow) Mithan, but all, from the Assamese standard were *Muh* Mithan.

R. M. PIZEY,
Hon. Forest Officer.

MONABARIE,
MIJIKAJAN, P.O.,
ASSAM.

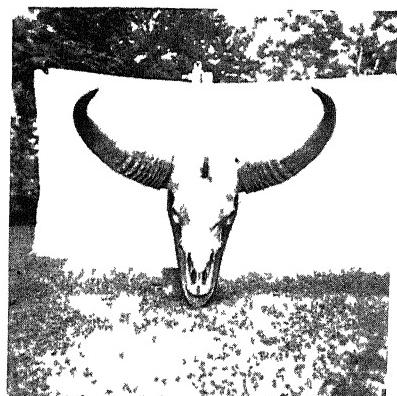
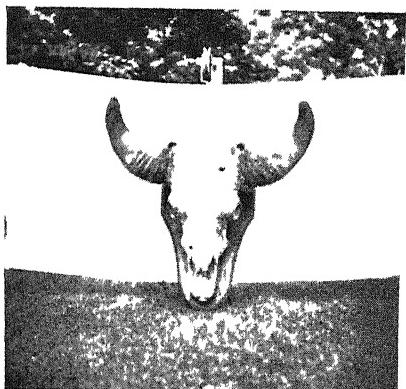
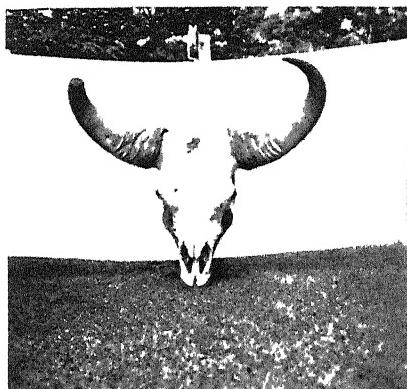
September 22, 1939.

[Lydekker in his Catalogue of Ungulates—Mammals issued by the British Museum recognises three local races of the Gaur. The distribution of the typical race *Bos gaurus gaurus* is given as the Peninsula of India including Nepal, Bhutan and Assam. The second race *Bos gaurus reedi* is given as inhabiting the hill forests of Burma and Tenasserim, while the third race *Bos gaurus hubbacki* is assigned to the Malay Peninsula.

The Indian and Burmese races are said to be distinguished from the Malay race by the presence of a forwardly inclined and prominent ridge between the horns, which gives the forehead a concave outline. This however is a character which may be absent in both Indian or Burmese Gaur.

Stuart Baker writing of the Gaur in Assam (*Journ. B.N.H.S.*, Vol. xv, p. 227) says that the majority of heads have a concave forehead, but that many have it only very slightly so and some not at all. He publishes a number of outline drawings in which he illustrates this variable character. All that can be said for this point of distinction between the Indo-Burmese and the Malay races is that while it may be applicable in general, it is not an absolute point of distinction as the concavity of the forehead may be very slight or entirely absent in many gaurs found within the Indo-Burmese region.

The Mithun, it is now established, is nothing more than a hybrid gaur. It is the result of crossbreeding between wild Gaur and domestic cattle. In Assam where inter-crossing between Gaur and Mithun still takes place, Mithun still closely resemble Gaur. In fact, there is more or less a gradual transition between the



Skulls of 4 Gaur [*Bos (Bibos) gaurus*] shot within a radius of 10 miles in Darrang, Assam. Note the marked variation in the development of the cranial ridge.

characters of the two animals. As shown by Mr. T. R. Livesey (*Journ. B.N.H.S.*, Vol. xxxv, p. 199) in the Chin Hills, where Gaur have been shot out to a large extent and opportunity for inter-breeding seldom occurs, Mithun show a considerable differentiation from the Gaur; but it is not till the fourth generation of inbreeding that the Chin Mithun reach the stage of development in which is produced those characters which typify the Mithun and distinguish it from the Gaur. The dome-like ridge between the horns and the concave forehead disappear. The line of the forehead between the horns is straight and the forehead itself flat and the horns show a slight upward curve and lose their inward sweep. If breeding with domestic cattle is continued the high dorsal ridge disappears. The horns become cow-like and the varied colourings of the domestic cow begin to appear. The persistence of Mithun depends then on frequent inter-breeding with wild Gaur. Such inter-breeding is still possible in the hill ranges of Assam. But in the Chin Hills where Gaur have been greatly reduced in numbers and the stock is said to be faced with extermination.—EDS.]

VII.—A LARGE HEAD OF THE INDIAN BUFFALO (*BOS BUBALIS* Linn.)

I do not know if the measurements of the buffalo head now in the bar of the Shillong Club have ever been placed on record in the *Journal*, but I send them herewith in case they have not. The details are taken from the engraved plate on the mount. This enormous head is of a female buffalo whose skeleton was found on the Manas River near Rajachong in February, 1932 by the late Col. P. H. Dundas, C.B., C.B.E., D.S.O.

Measurements:—

Length of horns—Right 62 7/8 in. Left 61 1/8 in.

Girth of horns—Right 19 1/4 in. Left 18 1/2 in.

Widest measurement inside—67 3/16 in.

Widest measurement outside—72 1/2 in.

Tip to tip round outside curve—11 ft. 9 3/8 in.

The Manas river forms the boundary between the Kamrup and Goalpara Districts of Assam. There is nothing to indicate that the animal was a domestic beast and this, I understand, was very unlikely.

R. E. PARSONS,

NOWGONG,

F.R.E.S.

ASSAM.

Indian Police.

September 1, 1939.

[A pair of detached horns of the Indian Buffalo which measure 77 3/8 in.—the largest specimens of their kind were discovered in the year 1885 in a cellar in Wapping by a Mr. Doyle who gave them to Sir Hans Sloane. They are now in the British Museum. The largest head from Assam measures 70 in. and is now in the American Museum of Natural History, New York.—Eds.]

VIII.—MEASUREMENTS AND WEIGHTS OF ELEPHANT TUSKS.

Mr. G. L. D. Millar's note, in the *Journal* of August 1939, on the weight and length of the tusks of his elephant is interesting. According to Rowland Ward's *Records of Big Game* T. H. Monteath shot an elephant with a single tusk in Assam: length: 7 ft. 4½ in.; weight: 85 lbs.

Another large tusker shot in Assam was that of C. N. Shadwell; its tusks were 7 ft. 4 in. and 7 ft. 3 in. in length, and weighed 77½ and 75½ lbs. In South India, Col. F. S. Gillespie shot a rogue elephant, with tusks crossed at the tips, which I believe was a record for South India: length: 8 ft. 2 in.; weight: 91 lbs. and 90½ lbs. (both tusks were of the same length). I was with Col. Gillespie at the time; and the elephant charged us furiously. Curiously enough I shot another very fine tusker, with crossed tusks, in almost the same place a year previously. The tusks of this rogue were crossed within about 18 in. of its jaw; and the elephant must have had considerable difficulty in feeding itself, which probably accounted for its evil disposition; and evil it was: it made a most unprovoked charge. The tusks were 7 ft. 7½ in. and 7 ft. 9 in. in length, and weighed 68 and 63 lbs. An elephant found dead on the Anamallais (S. India) had tusks 7 ft. 10 in. and 7 ft. 8½ in. in length, weighing 82½ and 79½ lbs.

R. C. MORRIS.

HONNAMETTI ESTATE,

ATTIKAN, MYSORE P.O.,

S. INDIA.

September 2, 1939.

IX.—MEMORANDUM ON THE KAHILU SANCTUARY.

(*A correction*).

The illustration of the foot prints of a Rhinoceros which appeared in my Memorandum on the Kahilu Sanctuary (*J.B.N.H.S.* Vol. xli, p. 155) were inadvertently labelled as those of *D. sumatrensis*. Though from their size, it might be assumed, that

there is little doubt they belong to this species, it should be noted that this identification has not been definitely established and a query should therefore have been printed after the specific name.

TURF CLUB, CAIRO,

D'ARCY WEATHERBE.

November 12, 1939.

X.—OCCURRENCE OF THE ALLIED GREY SHRIKE
(*LANIUS EXCUBITOR PALLIDIROSTRIS*) IN THE
RAWALPINDI DISTRICT, PUNJAB.

I am informed by Mr. Hugh Whistler that a Grey Shrike (♀) in my collection, which was obtained a few miles from Rawalpindi on the 20th November, 1930, has, with the help of Dr. C. B. Ticehurst, been identified as *pallidirostris*. This is of interest as there are only one or two other Indian records of this race.

H. W. WAITE,

RAWALPINDI,

M.B.O.U.

PUNJAB.

Indian Police.

September 18, 1939.

XI.—SWIFTS AND TERNS AT VENGURLA ROCKS.

It is strange how almost everybody has an inkling of birds' nests being made into soup. This is about all that I can remember of my school text-books, and I have always wanted to see them at closer quarters.

The trip was most unexpected. On Friday, the 3rd February, 1938, Mr. Prater rang up and inquired if I would care to go down to the Vengurla Rocks for the Edible-nest swifts on Monday. French leave was obviously necessary, and I said I couldn't—but that I would see him later in the day. I saw Mr. Prater, and left by the Goa ferry on Monday morning, with Nadir Tyabji, a stray cousin from Burma, and Baptista, the Society's veteran skinner and collector.

The journey down the coast was uneventful. The denuded ghats, washed down to bare, black rock were usually in sight. As soon as one gets south of Bombay, the Large-Crested Tern (*S. bergii*), advertised by its harsh chirruk accompanying every dive, is prominent, as also the White-bellied Sea-Eagle (*H. leucogaster*) soaring majestically out at sea.

We looked into both Hume's and Vidal's accounts of the rocks in *Stray Feathers* (iv, p. 419; ix, pp. 44-48), but they

appeared unsatisfactory. Hume (February 1875) found no trace of the swifts, and obtained addled eggs, mummies and remains of terns, which he has quite confidently identified as *Sterna unaetheta*. He also found addled eggs which he has referred to one or other of the *Laridae*.

Vidal never visited the islands himself, and merely records that his shikari brought him nests, eggs and parents on several occasions, between February and April. Vidal also records that the rights for collecting the swifts' nests were annually auctioned by Government and yielded about Rs. 30.

Maps indicated that the Vengurla Rocks are part of a semi-submerged reef running more or less parallel to the coast, at a distance of 4 or 5 miles. Hume records that the 'three large rocks, or rocky islands, are entirely metamorphic, and are composed of numerous varieties of quartzo-micaceous rock, mostly more or less ferruginous, and in many places a good deal decomposed and broken-up.'

We landed at Malwan at midnight and were received by Mr. Kalyani of the Fisheries Department. Motor-boats worked by the Fisheries Department were expected in, in a day or two, but in the absence of any definite news, we decided to attempt a landing with a fishing smack. A 20 ft. catamaran was obtained and we left Malwan at 3 p.m., with a stiff north wind blowing.

The Vengurla Rocks, about six miles to the south-west, were faintly visible in the distance, but the fisher-folk were sceptical about the landing. The going was bad right from the start, and we had hardly done a mile, when water was breaking clean over the prow. A large flock of *Sterna bergii* on the reef, was all the bird-life that we saw. Our stores and spirits were soon dampened, and when it was almost dusk the boat-men refused to proceed further, and decided to put in at Kochra. Kochra is at the mouth of a large tidal creek, and the rocks lie about 4 miles due west of it. The boat-men were positive that the wind would die down during the night, and that the rocks could easily be approached in the morning.

We were not particularly optimistic, but decided to have another shot in the morning. While getting into the boat at dawn, I noticed a swift of sorts, rather like a palm-swift, but a little heavier and clumsier, hawking over the mouth of the creek in some numbers. With a hazy notion that we had been visited by the residents of the Vengurla Rocks, we shot a few and the suspicion was confirmed. The birds, probably a hundred pairs, moved further inland along the creek, hawking in a loose, scattered flock.

Luck seemed to be in, and we made for the islands and landed on the eastern shore of the largest island. Of the three islets, the southernmost one bears the light-house, while the old light-house is on the smaller rock to the sea-ward. The island on which we landed was about 400 yards long, and 50-100 yards broad.

The landing was bad, and one had to jump on to a thick layer of *Ostrea* shells that encircled the island at sea-level. The island

is high and rocky, and covered with an extremely dense growth of thick, loose-jointed grass. I saw no soil on the island, and the grass grew in a thick layer of guano that covered every portion of the rock, not directly exposed to the brunt of the monsoon.

The grass was everywhere now quite dry, and strewn under tufts of grass, rocks and boulders, were scores of addled and broken eggs, and mummified and desiccated remains of terns. The only birds visible were a flock of about 10 pigeons.

The island rises to a height of about 150 ft., and we soon located the cave which runs into the solid rock for about a hundred yards. The cave is 60 ft. deep and 20 ft. broad, the sides running parallel and vertical. The floor of the cave almost runs on to the ring of shells encircling the island. At the end of the cave, i.e. about 100 yards inland, the roof has fallen in, forming a 'sky-light'. The root is 5-10 ft. thick.

We had landed without ropes, and descent through the sky-light was impossible. I managed to climb down the cliff on the sea-face, and slowly worked my way into the mouth of the cave. The sky-light arranged for the lighting, and my eyes became accustomed to the gloom in a few minutes. The 60-ft. wall on one side was 'pocked' with innumerable nests of swifts, hardly 6-8 in. from one another. There was not a single bird present. The nests were all just out of reach, and I managed to get a few by clambering up a small ledge. In the meantime, the fisher-folk had produced a rope and Tyabji came down through the sky-light.

We spent some time prospecting on the floor of the cave, and that lizard *Lygosoma* sp., with degenerate legs, was extremely common under the numerous stones and boulders on the floor. Almost every stone over-turned revealed a lizard. A couple of large rock scorpions were also unearthed, but not preserved.

Using the rope down the sky-light, we had a look at the innumerable nests, all swarming with a bug which proved on identification to be the common bed-bug *Cimex rotundatus* Sign. Vidal also records the taking of these bugs from the nests of these birds.¹ The nests were all empty, and in all stages of construction and probably represented the work of many years. I was unable to determine that any of them were fresh, and there was no trace of the pure white variety described by Vidal's shikari. Most of the nests were on the eastern wall (the cave runs north to south), possibly because this wall is better illuminated than the other. The nests, so far as I could ascertain, are no longer collected on a commercial basis.

There was little other life on the island. We found the eggs of a lizard (some form of *Hemidactylus*) on a rocky ledge, and a

¹ Dr. Baini Prashad informs us that there are specimens of this Bug in the Indian Museum collected at Calcutta by Dr. Annandale from the nests of the Swift.—Eps.

few insects. The small flock of pigeons contained a semi-albino, and the stomach of one bird shot, contained grass seeds, possibly obtained on the island. The only other birds seen were a white-bellied Sea-Eagle (*Haliuetus leucogaster*) and a pair of Blue Rock-Thrushes (*Monticola solitarius*), both the species, strangely enough, were seen by Hume when he visited the island some sixty years ago. And instead of a kestrel, we saw a harrier chasing pigeons.

As I have already stated, the whole of the island was literally strewn with the addled eggs and desiccated remains of terns. A few were collected at random as the boatmen proposed leaving us on the rock, if we did not care to return before the wind turned. What we obtained was sent to Mr. Hugh Whistler whose report is interesting. The eggs were compared with those in the British Museum, and Mr. Whistler writes:

'One fragment is obviously from a large egg, and agrees with eggs of *Sterna bergii* in colour and texture. All the rest of the eggs and imperfect eggs have suffered from bleaching and rotting, and might conceivably represent one species. All except two agree with the eggs of *Sterna repressa* (olim *albigena*), of which there is a good series in the British Museum. The other two eggs cannot be matched in the B. M. series of *S. repressa* but they do agree with eggs of *Sterna dougalli*, and there is a small series of eggs in the B. M. from the Davidson Collection which are labelled as having come from the Vengurla Rocks, collected by the light-house men, and attributed to this species. I am not aware of what evidence Davidson had for the identification of these eggs as *Sterna dougalli*. The species is not included in his North Kanara list, and I cannot trace any note published by him about these eggs. If it is correct that this species breeds on the Vengurla Rocks, these two eggs probably belong to it. On the other hand, tern eggs vary to some extent, and if I had not seen Davidson's eggs, I should have been content to pass these two eggs as within a possible range of variation for *Sterna repressa*.'

The mummified remains were handed over to Dr. Ticehurst who has reported on them as under:—

'These remains consist of :

(i) Wings and legs which are little more than skeletons, with some feathers attached. From the shape of the wing and the feet, they belong to a large tern, and correspond in size very well with *Sterna bergii*. From the pattern it is evidently a young bird and cannot yet fly, and the pattern of the feathers corresponds well with a juvenile *Sterna bergii* in the British Museum.

(ii) Several wings, legs and heads of a medium-sized tern; some wings and heads are those of adults and some are of half-grown young. From the feathers left on the crown of the adult it is evident that it was a black-capped tern, and therefore could not have been the head of *S. sumatrana*. The remains are too small to be those of *bergii*, *bengulensis*, *anglicus*, or *caspia*, and geographically they could not be those of *hirundo*, *macroura* or *longipennis*. The measurements of the adult heads, legs and wings correspond well with *Sterna repressa*, as does the pattern of the

adult wing. The juvenile wing has a pattern on the tertials reminiscent of *minuta*, but the remains are too large for any form of that species. Unfortunately there is no specimen of *Sterna repressa* in juvenile dress in British Museum for comparison, but there can be hardly any doubt that the remains belong to that species. There were remains of no other species.'

There is now real evidence that *Sterna bergii*, *anaetheta* and *repressa* breed on the rocks. I missed *anaetheta*, but my collection of eggs and remains was unfortunately haphazard, and I might have overlooked them. Alternatively, tern colonies in England move about in different years, and the same may happen in the Indian Ocean. As regards *dougalli*, apart from Davidson's eggs in the B. M., it might be worthwhile drawing attention to Eha's statement that they breed on the Vengurla Rocks (*Com. Birds of Bombay*, p. 195). On the way back from Kochra on the following morning, we saw the swifts back on the creek, and this apparently is their regular feeding area.

I must confess that the information and material obtained are regrettably incomplete. But I was rushed for time, and an exhaustive survey at any season would cover a couple of days. There is room for extensive and interesting field-work on the islands, but the difficulty of access is always present. A friend has offered to drop me on the island from an aeroplane during the monsoon, and I am waiting for somebody to offer to take me off!

HUMAYUN ABDULALI.

BOMBAY,

October, 1939.

XII.—WOOD SNIPE (*CAPPELLA NEMORICOLA*) NEAR BOMBAY.

Herewith the Snipe. It was shot by Mr. H. M. Molesworth last Sunday in tall grass on the edge of a small tank at Ambarnath. Mr. Molesworth says that the tank was situated very close to thick jungle at the foot of a hill, i.e., in a situation in which one often finds Woodcock. I shall be very glad if you will kindly identify it.

M. J. HACKNEY.*

IMPERIAL CHEMICAL HOUSE,

BALLARD ESTATE,

BOMBAY.

January 3, 1940.

[The bird is a Wood Snipe (*Capella nemoricola*) an infrequent cold weather visitor to the neighbourhood of Bombay. Two previous records are noted in Mr. Ali's Birds of Bombay and Salsette (*Jour. B.N.H.S.* Vol. xl., p. 642).—EDS.]

XIII.—ON THE OCCURRENCE OF THE BAIKAL OR CLUCKING TEAL (*NETTION FORMOSUM*) IN REWA STATE.

I am writing to inform you that at Mukundpur Jheel in Rewa State on Monday the 11th instant, a 'clucking teal' was shot during the shoot which had been arranged for His Excellency the Viceroy. I think that you would like to know this fact as the 'clucking teal' is, I understand, very rare in those parts.

I should be grateful if, when acknowledging this letter, you would say whether you have any recent records of clucking teal being shot in Rewa State or that part of India.

VICEROY'S CAMP,

INDIA.

B. M. MAHON, D.S.O., M.C.,

December 16, 1939.

Lieut.-Colonel,

Military Secretary to the Viceroy.

[This duck is one of our rarest winter visitors. There are a few records from various parts of India mentioned in the new *Fauna*. The following are additions to the 7 noted:—1930, Durbhangha (*Dutton*); 1931, Hardoi, U.P. (*Scott Macdougall*); 1933, Kathiar, Bengal (*Murphy*).—Eds.]

XIV.—THE LONG-TAILED DUCK (*CLANGULA HYEMALIS*) IN KASHMIR.

The other day I was asked to identify a duck which H. H. the Maharaja of Kashmir shot on the Hokra Jheel on the 17th October 1939. The bird is a male Long-tailed Duck (*Clangula hyemalis*). The total bag that day was as follows:—

Mallard	Pochard	Teal	Gadwall	Pintail	Wigeon	Shoveller
28	401	745	17	29	4	101

Long-tailed Duck. Total 1,326

I

F. LUDLOW.

C/o, POSTMASTER,

SRINAGAR,

KASHMIR.

November 4, 1939.

[The specimen was forwarded to the Society and is a male Long-tailed Duck. There is the 4th record of the occurrence of this duck within Indian limits during recent years. The three previous records are as follows:—1933, Chaman, Baluchistan (*Dredge*); 1935, Mesaki, Sadiya Frontier tract, Assam (*Parsons*); 1936, Drig, Sind (*Lambrick*).—Eds.]

XV.—QUAIL AND CHUKOR (*ALECTORIS GRAECA*).(4 *Query*).

At the end of July in some disused fields near water a large number of chukor were seen coming down to drink. The birds were hens with chicks three-quarters grown and also cock birds. The time was 9 a.m. About a fortnight later these birds were seen in the same area.

At the end of September when the shooting season was opened a drive in this area produced no birds but a couple of quail were shot.

The migratory period of quail up near Sandeman is about early in September.

Can any reader inform me whether it is likely that while the quail are migrating they will—due to their aggressiveness and fighting reputation—drive chukor from their feeding areas near crops. The crops are maize (Indian Corn).

1/2ND GOORKHAS,
FORT SANDEMAN.

C. G. TOOGOOD,
Lt.-Col.,

C.I.E., D.S.O. *

XVI.—UNUSUAL COLOURING IN A COMMON POCHARD (*NYROCA FULIGULA*).

(With a sketch).

We possess a Common Pochard on our Ornamental Duck Pond at present with a conspicuous white patch on each side of its head, between the eyes and the bill.

This Pochard was purchased in February 1939 from a dealer in Lucknow, along with a number of other Tufted Duck, and White-eyed Pochard, and at that time was exactly like a female Tufted Duck.

After moulting into the eclipse plumage, it has just again moulted out into full Winter Plumage, exhibiting these two very conspicuous white patches.

In every other respect the pochard is exactly like any female Tufted Pochard, the same dusky brown plumage, and whitish under the tail, same white wing bar, in fact, identical. Can you identify the Duck or explain



the presence of these white patches? A sketch of the head is enclosed.

LAHORE,

September 23, 1939.

T. W. DEEKS,

Vice President,

Ornamental Pheasant Society of London,
Curator, Zoological Gardens, Lahore.

[Young examples of this Pochard frequently show a streak of white feathers at the base of the bill though these disappear in the adult stage, but normally there is nothing like the white cheek patches shown in the illustration. Stuart Baker, however, in his *Indian Ducks and their Allies*, says that he has in his collection a fine young male which has a white face extending back fully half an inch from the base of the upper mandible and the specimen described above is probably a similar aberrant form. Writing to us on the 2nd February, Mr. Deeks says that though 'still conspicuous, the white facial patches are getting smaller and duller.'—EDS.]

XVII.—SNAKE ATTACKED BY FROGS

I was taking my usual early morning exercise near my bungalow two days ago when I noticed a European nearby obviously interested in something happening at the edge of a flooded piece of country. (The monsoon is very heavy at present, and there is a good deal of casual water about.) On joining him I saw a grass snake, about 2 ft. long, struggling with a fat frog in its mouth. A few seconds later, with the frog still in its mouth, it started to swim across the flood water, which was only about 15 yds. wide at this particular place. I noticed innumerable frogs, all croaking like fury, at the edge of the water, and remember wondering at the time what would happen if the snake chanced to land up anywhere near them. This is exactly what did take place, but I was certainly amazed when three or four large frogs immediately attacked the snake which was forced to release its victim. It should be noted that at the time of attack the snake was still in the water, and I presume this would place it at a disadvantage and at the same time allow the frogs to adopt tactics which would hardly have paid on dry land! I wonder if any of your readers have known this happen before?

H. N. CHARRINGTON.

No. 1, BODYGUARD LINES,

BALLYGUNGE,

CALCUTTA.

Field, August 19, 1939.

XVIII.—PYTHON INFESTED WITH NEMATODE WORMS
(*OPHIDASCARIS FILARIA*).

I had a Python about 11 feet in captivity with me since April; colour dull and poor-looking. Lethargic more than usual for these rather slow animals. Took a big dead bandicoot from my hand on August 30, found dead next morning. On dissection found bandicoot undigested in stomach, seen through walls about 8 inches below bottom of lung. Lung collapsed, dark, and found to be almost a mass of red worms, sent now, all sizes hence probably breeding in host. Found some of these on the body of a chicken which was found dead at the same time, a few being always kept in the python pen. May have crawled out of python's mouth when biting, if he bit chicken. Query are these the same as cause gapes in chickens, can they live in either host. Note chickens bought in bazaar are often moribund as dealers pick out those which are ill to sell off quickly. Hence whole pen may be infected by them; am anxious for remainder of pythons (five).

When I got the Python I noticed on part of its body, about where lungs would be, a darkish patch. I thought it might be a stain of earth-oil, petroleum, as I had just had the python-run oiled.

This patch seemed to grow and did not disappear when the skin changed, the Python was always very sluggish, probably due to insufficient oxygen. I presume the patch indicated a certain amount of what might be called inflammation. It lived about two months after I got it.

SEABURY EDWARDES.

10 YARDE STREET,

KAMAYUT P.O.,

LOWER BURMA.

September 9, 1939.

[The nematode worms taken from the lung of the Python have been identified at the Indian Museum as *Ophidascaris filaria* (Duj., 1845) Baylis, 1921. This worm is extremely common in Pythons and has a wide geographical distribution, occurring not only in the Asiatic forms, but also in *Python sebae* in Africa and in *P. spilotes* in Australia. It has also been recorded from a Monitor (*Varanus* sp.) in Zanzibar (Baylis, Parasitology, 1921). The adult forms are found in the intestine. Immature forms have been found on several occasions in the lungs of *Python molurus* and *P. reticulatus*. From this it may be inferred that the larvae go through a course of migration within the body of the host before settling permanently in the intestine. Their sojourn in the lung appears to be of considerable duration, as they may grow to a length of some 60 mm. in this situation. They do not, however, appear to acquire the definitive structure of the lips before leaving the lung.]

The adult worms attain a length of about 110 mm. in the male and 170 mm. in the female.

These particular nematodes are exclusively parasites of snakes and so far have not been known to attack other classes of animals. Their presence on the body of the chickens must have been effected by mechanical contact with the python.—Eds.]

XIX.—AN AGGRESSIVE KING COBRA (*NAIA HANNAH*).

(With two photos).



I enclose some snaps of a snake. A customer asks whether you can identify it. It was killed on a Tea Estate in the hills behind Tinnevelly after repeatedly attacking a woman. There were no noticeable markings on the back which was black.

M. W. LOWNDES.

MADRAS,

December 19, 1939.

[The snake is undoubtedly a king cobra. Though famed for its aggressiveness, king cobras like other snakes, will as readily seek safety in flight. Instances of unprovoked attack may generally be attributed to intrusion in the vicinity of the nest.—Eds.]

XX.--FLY FISHING FOR MAHSEER.

(By courtesy of the *Field*).

For many years the largest sizes of March brown, teal and green, and other sea-trout flies have been used for catching the smaller mahseer fish, up to 5 lb. It was not until after a fishing holiday in Kashmir, where we found how successful the peacock and March brown lures were for large brown and rainbow trout in the early months of the season, that we thought of using a large fly for the bigger mahseer. Our first experiments were in the Ganges, in a year when the river was exceptionally low. After spinning spoons and neatly-mounted dead baits had nearly scared the fish, we tried the big fly and found it surprisingly successful.

We were delighted with our 'discovery', only to find later, from the classics of mahseer literature, that this was no new thing; that many a large mahseer had been caught on flies long before our days, but that, in spite of this, the fly was disclaimed, rated one-third as successful as spinning, and rejected in practice. Subsequent years of fishing, in both India and Burma, make me think that judgment requires modification. It is true there are, as at home, some rivers on which the fly is not suitable, but there are many miles of ideal fly water. If the average size of fish caught is smaller than when one is spinning, more fish are caught, and one has the additional joy of playing them on a pliant, lissome fly rod.

On small rivers medium-size flies, $1\frac{1}{4}$ in. to 2 in. in length, have often been used, but I think that once one finds the trout rod and the sea-trout flies too small for the water, it is better to go direct to use of lures from 2 in. to $3\frac{1}{2}$ in. Standard patterns such as the Mar Lodge, Silver Doctor and Jack Scott are very good, but very expensive in the larger sizes. Simpler patterns, such as are given at the end of this article, have been found equally effective. These patterns are tied to represent the pale green Chilwa fry, silvery fry such as the Barillius Bola, dark fry like the Kalabans, and the golden mahseer fry, and have all caught numbers of mahseer. They are tied with two small single hooks, one behind the other, joined with Punjab wire. Large single hooks were found to be far too rank in point and barb and unnecessarily heavy.

After the monsoon rains, when the rivers, as they fall, are still too heavy for the trout rod, yet too small for a heavy spinning outfit, the big fly has caught many fish. During the hot-weather months it is successful in all normal-water conditions, but it has been of most advantage under low-water conditions, when a spoon and dead bait are not attractive.

Let us imagine a wide, stony nullah, dotted here and there with islands of trees or long grass, the river, fast flowing even through the pools, tears its way sometimes in the centre, sometimes on either bank of the river bed. Upstream and to the north, the foothills of the Himalayas rising to 6,000 ft. and more, the weather settled with not a cloud in the sky, the temperature 84 degrees in the shade. Hot? Yes! but the river is cooling, though warm enough to dispense with cumbersome waders. Thus unfettered, everything is set for an ideal day's mahseer fishing. The method we adopt is that used at home for fishing a sunk fly in the summer months. The cast is almost square across the stream to the far bank; line is then pulled in, with small jerks, so as to impart more movement to the lure, and to remove the belly in the line caused by the fast-intervening water. The quick movement of the fly, just after it hits the water, is very attractive to the mahseer, which will often be hooked in the early part of the cast. At times, when fishing very rapid water, the fly may drag on the surface, or, without dragging, move too fast for even the speedy mahseer. Under these circumstances the pace of the fly can be

reduced by raising the rod point or by using the greased line method of rolling the line upstream.

Red-letter days, ten fish weighing 95 lb., four fish 45 lb., five fish 57 lb., and sixty-one fish all over 10 lb. in weight in one season, indicate the measure of success, but leave to the imagination the joy and pleasure of catching mahseer on a fly, the most delightful of all methods of angling.

Here are a few successful patterns: (1) *Chilwa*.—Tail, golden pheasant topping; body, pale green seal's fur ribbed with wide silver tinsel; wings, teal; throat, wigeon. (2) *B. bola*.—Tail, golden pheasant topping; body, light silver grey natural fur ribbed with wide silver tinsel; throat, light blue and wigeon; wings, teal. (3) *Kalabans*.—Tail, golden pheasant topping; body, black seal's fur plus silver tinsel; throat, green and guinea fowl; wings, bronze mallard and a narrow band of teal. (4) *Mahseer*.—Tail, golden pheasant topping; body, light silver grey natural fur ribbed throat, red golden pheasant breast feather; wings, brown black turkey with white tips overlaid with brown mallard; cheeks, chattering. The dubbing of the bodies is very freely picked out in all cases.

J. R. M.

MAY 20, 1939.

XXI.—THE FISH *MEGALOPS* AS AN AID TO COMBAT THE GUINEA-WORM CARRIER *CYCLOPS*.

The prevention of infection by guinea-worm disease has engaged the attention of investigators all over India. Papers in various scientific journals attest to the work done on the subject. Guinea-worm infection, as is well-known, is caused by the swallowing of a microscopic crustacean, or water flea (*Cyclops*) when drinking water. The disease manifests itself in human beings if the Cyclops swallowed happen to carry larvae of guinea-worm. The disease is not unknown in the Bombay Province and is endemic so close to Bombay as in the Kolaba district.

Attempts to control the disease here were made in 1928 by Rao Saheb Y. M. Pradhan, M.C.P.S., who was specially deputed as Health Officer to investigate the disease. His investigations disclosed that on an average 10% of the population there was infected during the endemic season, i.e., from February to May, and that the disease reached its maximum incidence in April.

The Cyclops as is well-known, is the intermediate host of the guinea-worm. A good deal of research on this pest has accordingly been directed to the discovery of a suitable fish that will feed on the Cyclops and in whose stomach the larvae of the guinea-worm may be destroyed. Rao Saheb Pradhan and other workers in the field elsewhere in India experimented with different varieties of fish to destroy the Cyclops. The fishes employed by Rao Saheb Pradhan were:—

Rasbora daniconius, *Haplochilus lineatus* (panchax), *Barbus phutunio*, *Polycanthus cupanus*, and *Nemachilus*.

Dr. V. N. Moorty, Guinea-worm Research Officer, Department of Health, Mysore, in his investigations in the Chitaldrug district where the disease is rampant used the following fishes:—

Barbus (Puntius) puckelli, *Barbus (I'untius) lictio*, *Barbus sophore*, *Barbus chola*, *Lepidocephalocythys thermalis*, *Rasbora daniconius*, and *Gambusia*.

The fishes employed by both investigators were fresh water fishes. Both authors merely state the extent of the partiality of the various fishes for Cyclops, but they do not record what their investigations of the stomach contents of the fishes showed.

The value of the use of fishes to destroy Cyclops is self-evident. It would not only be more effective and safer, inasmuch as it would obviate the risk of endangering the purity of the water supply by the introduction of chemicals, but would be economical as it could be carried out without excessive expenditure. Dr. Moorty calls attention, however, to an important factor, which is that fresh water fishes of any species do not thrive efficiently enough in step wells in villages infected with guinea-worm.

A fish that may effectively exterminate the Cyclops in wells and ponds, in our opinion, seems to be *Megalops cyprinoides*. We have been experimenting with various fresh water fishes to gauge their suitability to stock sheets of water in pursuance of Government's scheme to develop the fresh water fisheries. The stomach contents of the fishes selected for the experiment were examined at the same time as their rate of growth and life history were being studied. Fingerlings of *Megalops*, of which the stomach contents were examined varied from 1 in. to 4 in. in length. The stomach consisted almost exclusively of cyclops. *Megalops* of also larger size, measuring in length about 7 in. and collected from large ponds, showed that the food material in the intestinal tract consisted predominantly of cyclops and to a less extent of fragments of other crustacea, and larvae of aquatic insects. The ponds abounded in other food material also, but the megalops manifested a decided predilection for cyclops.

The observations thus indicate that the *Megalops* in its early stages, at least until the time it attains a size of about 4 in. is essentially a selective feeder. Even in later stages the fish continues to consume *Cyclops*. This evidence seems to lend ground to the view that wherever the fingerlings of *Megalops* are introduced, they will tend to feed on *Cyclops*. The problem for investigation is to determine the size up to which fingerlings of *Megalops* subsist chiefly on *Cyclops*. Even if it be established that fingerlings up to only a certain size are useful for the destruction of *Cyclops*, there should be no difficulty in obtaining such fingerlings for stocking purposes, as fry and fingerlings are available in large numbers every year around our coast.

An examination of other fishes, including, among others, some of those listed by R. S. Pradhan and Dr. Moorty, which were dissected by us, showed but insignificant quantities of cyclops in their intestinal tract. The investigation also showed that several fresh water fishes, some to a greater, others to a less extent, feed

on cyclops, but *Megalops* stands out amongst all as a voracious and selective feeder of the pest.

Megalops is a marine fish. It breeds in the sea, and the fry during the monsoon moves up to puddles or ponds of fresh water which border creeks and flow into the sea. The fry of this fish is remarkably abundant in such puddles and may be collected in copious quantities for distribution in either fresh or brackish water where the occurrence of cyclops is notorious. A striking characteristic noted about the fish in the Kolaba district is its distribution in large quantities close to the sea specially at such places as are afflicted with the guinea-worm.

Other characteristics of the fish are its remarkable adaptability to any type of environment. It flourishes equally vigorously in fresh water as in dirty muddy water as well as in step wells. It is extremely hardy and seems to be an air breather. It can be transported with ease over long distances to wherever the pest occurs. Its suitability for the eradication of the guinea-worm can only definitely be established by its intensive introduction in areas where the incidence of the disease is now great.

Observations of this department are of the sketchiest kind and no finality can be attached to them. Further investigation will be necessary before it can be established with certainty that the *Megalops* is the best agent for the destruction of the pest. The object of the note is to draw attention to the possibility of the usefulness of *Megalops* in this direction.

S. B. SETNA,

M.Sc., F.R.M.S., Ph.D.,

*Fisheries Officer,
and*

C. V. KULKARNI,

B.A., B.Sc.,

*Piscicultural Assistant,
Department of Industries, Bombay.*

[Wallinger in a note in the Society's *Journal* (Vol. xv, p. 720) refers to the ready adaptability of *Megalops cyprinoides* to life in fresh water. Fingerlings 3 in. in length put into a stock tank by him in the month of July had by the following April reached a length of 10 in. and a weight of $1\frac{1}{2}$ lb. He recommends the stocking of tanks with this fish because of its marvellous fly-taking propensities. The authors of the above note now provide an additional recommendation. It seems clear that fingerlings of this fish feed largely on Cyclops: but the question arises as to the extent to which cyclops form the food of adult fishes. The limitation of the destruction of Cyclops mainly to the fingerling stage in *Megalops* would reduce its utility as a destroyer of this pest, particularly, as we have no evidence so far to indicate that *Megalops* breeds in fresh water.—EDS.]

**XXII.—A CASE OF RECOVERY FROM THE BITE OF
THE SAW-SCALED VIPER (*ECHIS CARINATA*).**

The attached Medical Case Sheet in respect of a case of snake bite *Echis carinata* which was admitted to the Indian Military Hospital, Bangalore on the 23rd September 1939 is forwarded herewith.

Date	History	Treatment
23-9-39	<p>The patient states that he was bitten by a small snake on his left middle finger while cutting grass at 14.00 hours. He was immediately taken to British Military Hospital.</p> <p>15.10 hours. Blood stained vomit.</p> <p>15.20 hours. Blood stained vomit.</p> <p>17.30 hours. Condition of patient improved and he was sent to Indian Military Hospital. The colleague of the patient had killed the snake and on the following day it was brought to Indian Military Hospital where Lieut. G. J. Ferris, I.O.M., I.D.S.M., I.M.D. Sub-Charge, identified it as 'ECHIS CARINATA', and this was subsequently confirmed by Natural His. Society of Bombay.</p> <p>Condition on Admission.— (Indian Military Hospital)</p>	<p>14.25 hours. He was given 30 c.c. anti-venene concentrated intravenously and incision made at site of bite and potassium permanganate crystals applied.</p> <p>17.00 hours. 20 c.c. concentrated anti-venene given intraverously and 2 c.c. Calcium gluconate and 1.5 c.c. Coramine intravenous.</p>
23-9-39	Temperature 99.5, Pulse 100, Respiration 22. Patient looks anxious, excited and trembling. Patient was assured that he would recover completely which gave him courage and tended to allay his anxiety and excitement somewhat.	Glucose by mouth $\frac{1}{2}$ oz. every hour. Keep warm in bed and hot coffee every two hours.
23-9-39	21.30 hours. Patient feels much better but complains of pain at site of wound.	
24-9-39	Oozing at site of wound. Oozing continued till 29-9-39 when it stopped. Mouth foul due to ulcers on the buccal mucous membrane.	Calcium lactate 15 Gr. T.D.S. Condy's gargle.

Date	History	Treatment
2-0-39	Temperature 102° Pulse 116 Respiration 26, Mouth foul Patient looks ill Haemorrhage from ear started Patient placed on S I List	Calcium lactate 31 gr T D S Serum (Intramuscular) g ve 1 to check haemorrhage In absence of plain horse serum anti Dysenteric serum 40 c c administered Condy's gargle
5-10-39	Temperature 101°, Pulse 94 Respiration 26 Patient better Removed from S I List	
9-10-39	Haematuria started The haematuria continued and slowly decreased day by day Slight paralysis of tongue noticed, and patient finds difficulty in putting the tongue out	Calcium lactate 31 gr T D S Serum given to check haemorrhage Condy's gargle Strychnine injection 1/60 Gr 9-10-39 Do 11-10-39 Do 13-10-39
13-10-39	Urine completely free from blood Patient can protrude the tongue	Condy's gargle
17-10-39	Patient is convalescent	
2-11-39	Making good progress Patient completely recovered and discharged to duty	

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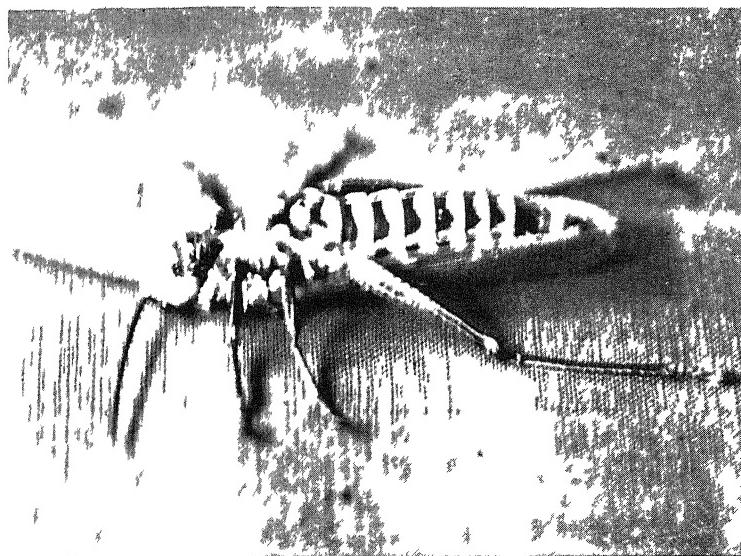
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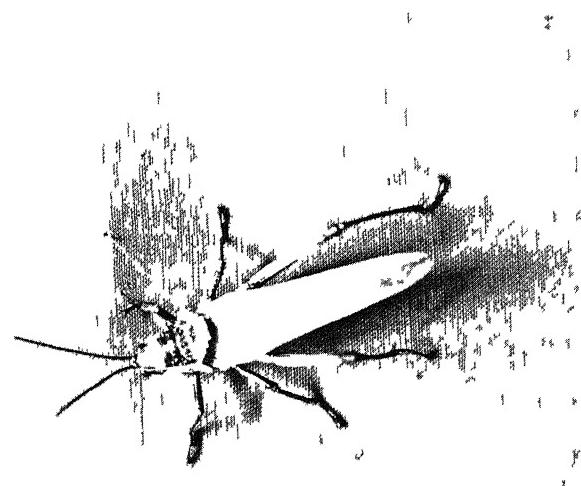
XXIII—A VISITATION OF THE SPOITED LOCUST
(*AULARCHES MILIARIS L.*) IN TRAVANCORE.

(With a plate).

Kirby (1914) describes three species of *Aularches* in India viz ; *A miliaris*, *A punctatus* and *A scabiosae* and further states that according to certain workers the two latter species are only varieties of the first-mentioned one which forms the type of the genus. This opinion appears to be correct in view of the close resemblance of the three forms *A miliaris*, also known as the Coffee Locust (Lefroy, 1909), due to its frequent occurrence in large numbers in coffee plantations, in Ceylon, is known to be an occasional serious pest (Green, 1898 and 1906 and Hutson, 1926 and 1928). The Ceylon and Travancore forms are identical and both belong to the same species, *scabiosae* (Photographs, 1 and 2). During normal years when there are no swarms, isolated insects are found in the plains and in the hilly tracts. They are easily



Ventral view



Dorsal view

The Spotted Locust (*Aulacizes milvans* L.)

identified from every other grasshopper by their characteristic warning coloration, and by the secretion given off from the sides of the thorax which froths up on coming into contact with air and gives a very unpleasant smell when handled.¹

Locusts and serious grasshopper pests are practically unknown in Travancore and the only previous record is of an outbreak of *A. miliaris* (*scabiosae?*) at Manimala near the lower slopes of the Western Ghats in Travancore about eighteen years ago. There has been a recent outbreak of this pest in a serious form at Kalanjoor in Central Travancore about ten miles to the north of Punaloor (Railway Station). The attack was first reported during the middle of June 1939 a fortnight after it was noticed. The insect was first observed in the young teak plantation at Valia-konam, Kalanjoor; but in the beginning no importance was attached to it by the local ryots. When after a complete defoliation of the teak trees the vanguard of the swarm invaded the cultivated areas panic began among them. The following are the more important of the trees subjected to attack:—teak, coconut, mango, areca, jack and plantain. The swarm which was at first moving as a body divided at the middle of June into two, one proceeding towards the west into the cultivated area mostly attacking isolated teak trees and the other towards the south into the Vazappara teak plantation, and gradually got scattered in different directions. During the peak of the attack the whole swarm occupied roughly an area of about quarter of a mile long and fifty yards wide.

The grasshoppers seldom came to earth except by accident and hence none of the ground crops like tapioca and rice were affected. Their preference for teak leaf was remarkable and it was not unusual to see the branches of this tree bent down by the weight of the pest. Every leaf had on an average from twenty to thirty insects and due to their protective coloration it was hard to detect their presence except for the chirruping noise they made and the continuous fall of the faecal pellets. When disturbed they always moved forwards in the direction opposite to that whence they came.

Little is known about the life-cycle of this pest in Travancore. Since it is of greater economic importance in Ceylon the life-history has been worked out there and it is briefly as follows. The winged adults which come out during the latter half of July begin mating from the third week of August, and about the middle of November they congregate in large numbers on the ground for egg-laying. Eggs as usual are laid in masses in the earth by inserting the abdomen into it. No preference is shown to any particular type of soil. Each egg mass is about 1.5 to 3 inches long containing on an average about 80 eggs. The adults die soon after oviposition. Eggs are pale yellow or honey-coloured when freshly laid

¹ This interesting phenomenon met with in certain insects is given in detail by G. D. H. Carpenter and H. Eltringham in *Proc. Zool. Soc. Lond.* Vol. 108, Ser. A. Part II 1938, pp. 243-252.

and turn darker as development progresses. The eggs take about four months to hatch out and the young nymphs come out in April. Under normal conditions they pass through six instars and the nymphal period on an average ranges from five to six months. The adults live for about 5 months. There is only a single brood every year. In Travancore judging from the recent attack the winged adults appear to come out in June, earlier than in Ceylon.

As the adults always remain on the tops of trees control measures are possible only either during the hopper stages when they are devoid of wings or when they congregate in large numbers in the ground for egg-laying. Very young nymphs may be killed by spraying them with soap solution and egg masses can be dug out and destroyed. Shaking the plants on which the adults congregate and handpicking those that fall to the ground may also be effective. Natural enemies appear to be few for this pest.

I am indebted to Dr. J. C. Hutson, Agricultural Entomologist, Ceylon, for kindly sending me references regarding this pest there.

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TRIVANDRUM.

S. JONES.

XXIV.—ASSOCIATION BETWEEN *BATOCERA RUBUS* L. AND BOOK-SCORPIONS (*CHELIFER*).

On the evening of December 1, at Andheri, Salsette Island, a large Longicorn beetle (*Batocera rubus*: *Cerambycidae*) attracted by the light, flew in through my window. On examining the specimen I noticed a Book-Scorpion drop off it. A little later another appeared from under the wing-cases. On lifting the wing-cases another nine came to light. On critical examination under the microscope I discovered that both the beetle and the Book-Scorpions were infested with minute mites probably of the family *Tyroglyphidae*.

The presence of Book-Scorpions on the bodies of insects is well-known, this record fixes the identity of one of the carriers in India. Book-Scorpions are not parasitic, but feed on minute animal life, and one is naturally tempted to seek an explanation

for their presence in such a number on a single insect. The only suggestion that offers itself seems to be that the Book-Scorpions feed on the mites which infest their hosts, and are therefore beneficial to the insects in that they reduce the insects' body parasites. This reason appears quite plausible as they must be attracted to inhabit the body of the beetle by something, not merely for the sake of transport! An examination of another beetle that came in the following night showed that there were no Book-Scorpions present, but at the same time the number of mites was very small. This seems to show that there is some relation between the presence of the mites and the Book-Scorpions.

C. McCANN.

BOMBAY NATURAL HISTORY SOCIETY,

BOMBAY.

December 4, 1939.

XXV.—ON *FREREA INDICA*.

Mr. McCann's interesting article on *Frerea indica*, p. 143 of your August number.

I had this plant at Kate's Point, Mahabaleshwar, in October 1924. I have never again been to Mahabaleshwar in the cold weather, and so have not seen it again. The specimen I took for my herbarium is still recognizable and has leaves as described and pictured by Mr. McCann; the flowers have parted from the stem. Perhaps Mr. McCann would like to call and see the specimen.

The rough note made at the time was as follows.—‘On outcrop ‘rock exposed to sun. The flower is brown purple with v-shaped ‘yellow markings and interrupted yellow lines. Lobes of corolla ‘sometimes six’.

Its close, but leafless, relation *Caralluma fimbriata* is common on the bare grassy hills round Kolhapur, where it grows in small clumps in the shade of prickly pear, flowers in the rains, and produces very long thin follicles in the cold weather. I also noted it (*Caralluma*) in the Kamkhed taluka of Ahmednagar.

R. D. BOMBAY.

BISHOP'S LODGE,

MALABAR HILL,

BOMBAY 6.

December 22, 1939.

XXVI.—ON THE OCCURRENCE OF *CICHORIUM INTYBUS*
LINN. (*Chicory*) IN HYDERABAD, DECCAN.

(With a plate)

Cichorium Intybus Linn., a native of Europe naturalised in America and familiar to many as a weed, is a pot herb, a salad, and the leading adulterant of Coffee. It is chiefly cultivated for its leaves and roots. It is common in Simla, N.-W. India and W. Asia. There is no record of its having been grown in the Deccan. Cooke in his Flora of the Presidency of Bombay says that Chicory is rarely grown in the Deccan. Gamble in his Flora of the Presidency of Madras mentions nothing about this plant.

Last year in the month of October the writer by chance visited a place known as the Lingampalli Canal and came across a single plant of *Cichorium* in flower (Fig. 1.), which was an altogether unexpected occurrence. A few months later the writer visited the place again and found a single withered plant which was uprooted to see if there were any tuberous roots. There were none. Thinking that it might be an escape, enquiries were made from the Florists in Poona and Bangalore if they supplied seeds of Chicory. They expressed their inability to supply the seeds of Chicory as it was not grown either in the Bombay Presidency or in Bangalore.

The replies aroused more interest in the writer and the place was visited again in August, 1939 in the early rainy season. It was a matter of great delight to find a large number of young plants of Chicory (Fig. 2) growing wild amongst other more vigorous plants, such as *Amaranthus spinosus* Linn., *A. oleraceus* Roxb., *Portulaca oleracea* Linn., *Sclerocarpus africanus* Jacq., *Vernonia cinerea* Less., *Phyllanthus Niruri* Linn., *Cynodon dactylon* Pers., several species of *Euphorbia*, and others. It was further noted that as the hardier plants spread more and more they seem to limit and overcome the new-comers (Chicory). In spite of this struggle and the disadvantage of a new environment some of the plants of Chicory survived and bore flowers.

Since Chicory is a useful pot-herb and needs no special attention and care as has been observed by the writer, it is advisable to introduce it on a large scale not only in the Deccan but elsewhere also. The climatic and edaphic conditions of the Deccan seem to be quite favourable for the growth of this plant.

M. ABDUS SALAM.

DEPARTMENT OF BOTANY,
OSMANIA UNIVERSITY,
HYDERABAD (Dn.),
September 30, 1939.

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TORT, BOMBAY



Flowers of Chickory (*Cichorium Intybus* Linn.)



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